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ABSTRACT

Papers from a conference on small college computing issues are: "An On-line Microcomputer Course for Pre-service Teachers" (Mary K. Abkemeier); "The Mathematics and Computer Science Learning Center (MLC)" (Solomon T. Abraham); "Multimedia for the Non-Computer Science Faculty Member" (Stephen T. Anderson, Sr.); "Achieving Continuous Improvement: Theories that Support a System Change" (Donald Armel); "Two Model Dual Degree Programs in Computational Science for Small Universities" (Gary M. Brady, Manuel Keeper, and Laura B. Smith); "Rock Hill Business, Education, and Community Online Network" (Alan Broyles); "Multimedia: Bringing the Sciences to Life--Experiences with Multimedia in the Life Sciences" (Jane F. Cavender and Steve M. Rutter); "Ethical Issues Involving the Internet" (Mary V. Connolly); "Migration to Windows NT" (Daniel T. Doles); "Are Computer Science Students Ready for the Real World" (Noreen Elliot); "Video Networks in an Electronic Classroom Environment and Analysis of Student Preferences in the Development of a Network-Based Video Distribution System" (Anatoliy Gordonov, Michael Kress, and Marianne Carlin); "The Role of Facilities and Faculty Peer-to-Peer Mentoring in Supporting Faculty's Use of Multimedia/Computer Technologies in Support of Classroom Instruction" (Arthur W. Haffner and Michael E. Kress); "IS Staff Migration to New Technology" (David G. Holland); "Design and Implement Custom Electronic Performance Support Systems (EPSS) for Training in Project Based Classes" (Brian R. Hoyt, Mark Stockman, and Jerry Thalman); "Using Authorware and Shockwave To Create Interactive HTML Pages" (Janet E. Hurn); "Power Pedagogy: Integrating Technology in the Classroom" (Benjoe A. Julianio); "An Administrative Model for Virtual Website Hosting" (Jerry Kandies); "Small College AI" (Harold H. Kollmeier); "The Emerging Trends in Application Integration" (David K. Moldoff); "Program-to-Program Articulation for the World Wide Web" (Charles H. Morton); "A New Hire Training Program for the 'Old' and the 'New'" (Jon Mueller); "Is Your Curriculum Up-to-Date" (Thomas A. Pollack); "Supporting Student Teachers with Laptop Computers: A Project of the School of Education at Columbus State University" (Dutchie Riggsby); "Evaluating the Effectiveness of a Formal Ethics Component in the Computer Science Curriculum" (Stephen J. Sheel and E. Eugene Collins); "The Web-Database Connection: Tools for Sharing Information

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on the Campus Intranet" (Nancy E. Thibeault); "MIS On-Line" (Nancy S. Thomson, DonnaRose Echeverria, and Bob Mills); "Integrating a Computerized Testing System and Electronic Lecture Notes in First-Year Mathematics Courses" (Ray Treadway); "Distance Education VIA the Internet (Methodology and Results)" (William Verbrugge); and "Delivering Library Information Across the Network: One Model for Successful Implementations" (William P. Wilson).
(SWC)

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ASCUE



ASSOCIATION OF SMALL COMPUTER USERS IN EDUCATION
"Our Second Quarter Century of Resource Sharing"

Proceedings of the 1997 ASCUE Summer Conference

30th Annual Conference
June 7 - 12, 1997

North Myrtle Beach, South Carolina

Edited by Peter Smith, Saint Mary's College

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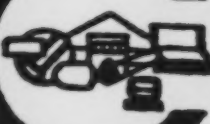
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Association of Small Computer Users in Education "Our Thirtieth Year of Resource Sharing"

Proceedings of the 1997 ASCUE Summer Conference
30th Annual conference
June 7-12, 1997
Myrtle Beach, South Carolina

ABOUT ASCUE

ASCUE, the Association of Small Computer Users in Education, is a group of people interested in small college computing issues. It is a blend of people from all over the country who use computers in their teaching, academic support, and administrative support functions. Begun in 1968 as CUETUG, The College and University Eleven Thirty User's Group, with an initial membership requirement of sharing at least one piece of software each year with other members, ASCUE has a strong tradition of bringing its members together to pool their resources to help each other. It no longer requires its members to share homegrown software, nor does it have ties to a particular hardware platform. However, ASCUE continues the tradition of sharing through its national conference held every year in June, its conference proceedings, and its newsletter. ASCUE proudly affirms this tradition in its motto "Our Thirtieth Year of Resource Sharing."

ASCUE's ASCUE-L LISTSERVER

Subscribe by sending the E-mail message `SUBSCRIBE ASCUE-L yourname to listserv@gettysburg.edu`. The listserv itself is `ascue-l@gettysburg.edu`. In order to stop the flooding of the listserv with unwanted solicitations, we have set it up so that you will have to send messages from the address you subscribed from.

NEED MORE INFORMATION?

Direct questions about the contents of the 1997 Conference to Christine Schwartz, Program Chair, ASCUE '97, Director of Computer Services, Ursuline College, Cleveland, OH 44124, 216-449-4471, cschwart@main.ursuline.edu.

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Our Thirtieth Anniversary Conference

This will be our thirtieth annual conference, and we are celebrating in our traditional way with a special Ice Cream Party on Tuesday afternoon, June 10, 1997. We hope that you and you family will plan to join this celebration. During our tenth anniversary conference we were priveleged to have Admiral Grace Hopper as our keynote speaker. Our Historian, Jack Cundiff, has provided a copy of our tenth conference brochure which I have included below and on the facing page. Note that the tenth conference was only 2½ days long and had no concurrent sessions. We have come a long way in twenty years.



GRACE MURRAY HOPPER

Grace Murray Hopper was born in New York City. A 1928 Phi Beta Kappa graduate of Vassar College, she also was a recipient of a Vassar College Fellowship. She received her master of arts degree (1930) and doctor of philosophy degree (1934) from Yale University. In December 1943, she entered the United States Naval Reserve and attended the USNR Midshipman's School—W at Northampton, Massachusetts. Upon graduation she was commissioned Lieutenant (JG) and ordered to the Bureau of Ordnance Computation Project at Harvard University. In 1946, she joined the Harvard faculty as a Research Fellow in Engineering Sciences and Applied Physics at the Computation Laboratory where work continued on the Mark II and Mark III computers for the Navy.

In 1949, she joined the Eckert-Mauchly Computer Corporation, Philadelphia, then building UNIVAC I, the first commercial, large-scale electronic computer, as Senior Mathematician, and in 1964, became Staff Scientist, Systems Programming. She retired from the UNIVAC Division of Sperry Rand Corporation in December 1971, while on military leave.

During the years from 1952 to the present, she has published over fifty papers and articles on software and programming languages. Her interest in applications programming sent her to the first meeting of CODASYL with a strong interest in the development of COBOL. She is presently serving on the CODASYL Executive Committee.

Selected to receive the 1964 Achievement Award by the Society of Women Engineers, she was selected also, by the Data Processing Management Association as their first Computer Sciences "Man-of-the-Year" in 1969. She received the honorary Doctor of Laws degree from the University of Pennsylvania in 1974.

Maintaining her close connection with the Naval Reserve, she successively progressed to the ranks of Lieutenant, Lieutenant Commander and Commander, retiring in 1966. Recalled to active duty in August 1967, she was promoted to the rank of Captain on the retired list of the Naval Reserve. Captain Hopper is presently serving, on active duty, in the Information System Division of OPNAV as OP-911F.

* * * * *

TENTH ANNUAL CONFERENCE

June 21, 1977 – June 23, 1977

Albright College
Reading, Pennsylvania

PROGRAM

TUESDAY, JUNE 21

CAMPUS THEATER

- 7:30 BREAKFAST
- 8:30 Welcome
Dr. Arthur L. Schultz
President, Albright College
- 9:00 (19) A Business-Oriented Computer
Science Curriculum
Sister Mary K. Keller
- 10:00 COFFEE BREAK
- 10:30 (5) A Conversion from IBM 1130 to
HP 3000 Series II
E. James Runde
- 11:30 (7) BASIC - A Language for
Instructional Use
James P. Schwar
- 12:00 LUNCH
- 1:30 FUTURE SHOCK
Capt. Grace Murray Hopper
- 3:00 COFFEE BREAK
- 3:30 (14) Little Leap or Giant Step
Richard K. Wood
- 4:30 (4) CHEBO - Checkerboard Model of
Social Interaction
James M. Sakoda
- 5:30 DINNER
- 7:00 "Birds of a Feather" Session

SOUTH LOUNGE

- (10) Structured Programming in the Small
Computer Center
Al Cini
- (12) Power Management on a System 7
James H. Westmoreland

WEDNESDAY, JUNE 22

CAMPUS THEATER

- 7:30 BREAKFAST
- 8:30 (3) Eating is Not Enough
John & Miriam Jacobs
- 9:00 (6) Mini Computers Growing Role
in Education
Robert F. Trocchi
- 10:30 COFFEE BREAK
- 11:00 (11) An Individualized Academic
Advisement System
David North
- 12:00 LUNCH
- 1:30 (1) Culprit: The Computerized Teacher's Helper
John Koelzer
- 2:00 (2) SIGI: A Computer-based Career
Guidance System
Katharine Darlington
- 3:30 COFFEE BREAK
- 4:00 ASCUE BUSINESS MEETING
- 6:00 ASCUE
DINNER - THEATER

SOUTH LOUNGE

- (17) GUMS - V2M13
Richard Wood
Michael Anderson
- (8) A one Credit Course in APL as a Precursor
to FORTRAN/COBOL
Dr. John Schurdak & Winston Tellis
- (15) Computer Aided Registration System
James H. Westmoreland

THURSDAY, JUNE 23

CAMPUS THEATER

- 7:30 BREAKFAST
- 8:30 (13) Football Scouting Report
David Dayton
- 9:00 (9) POISE
Dan Kinnard
- 10:00 COFFEE BREAK
- 10:30 (20) 1130 Conversion - A User's Dilemma
Albright College Panel
- 11:30 LUNCH

SOUTH LOUNGE

- Handbook for the Researcher
Using Discrete Statistics
Cheryl Jalbert - Dawson U.
- (18) Albright Statistical Package
Dr. Thomas Meyers
- (21) A Mini-Computer Data Base System
Fred Wenn

Association of Small Computer Users in Education

ASCUE 1996-1997 Board Members

(years remaining in office including current year)

PRESIDENT

Carl Singer (1 year)
Computer Center
Depauw University
Greencastle, IN 46135
317-658-4294
singer@depauw.edu

PAST PRESIDENT

Mary Connolly (1 year)
Mathematics Department
Saint Mary's College
Notre Dame, IN 46556
219-284-4497
connolly@saintmarys.edu

PROGRAM CHAIR

Christine Schwartz (1 year)
Director of Computer Services
Ursuline College
Cleveland, OH 44124
216-449-4471
cschwartz@main.ursuline.edu

TREASURER

Thomas Pollack (2 years)
School of Business Administration
Duquesne University
706 Rockwell Hall
Pittsburgh, PA 15282
412-396-1639
pollack@duq2.cc.duq.edu

SECRETARY

Dagrun Bennett (1 year)
Computing Services
Franklin College
Franklin, IN 46131
317-738-8150
bennett@franklincoll.edu

NEWSLETTER EDITOR

Peter Smith (1 year)
Saint Mary's College
Notre Dame, IN 46556
219-284-4493
psmith@saintmarys.edu

LIBRARY/HISTORIAN

Jack Cundiff (1 year)
Horry-Georgetown Technical College
Box 1966
Conway, SC 29526
803-347-3186
cundiffj@hgtc.hor.tec.sc.edu

BOARD MEMBER AT LARGE

F.P.(Rick) Huston III (1 year)
University of South Carolina - Aiken
171 University Parkway
Aiken, SC 29801
803-648-6851
rickh@aiken.scarolina.edu

BOARD MEMBER AT LARGE

Richard Stewart (2 years)
Director of distance Learning
Lutheran Theological Seminary
7301 Germantown Avenue
Philadelphia, PA 19119
215-248-4616
richard.stewart.parti@ecunet.org

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Keynote Speakers

Edward J. Barboni (Ph.D., Cornell University, 1976, BA, Purdue University, 1971) is Senior Associate for CIC (Council of Independent Colleges) for its technology related projects. He is also an independent consultant for colleges, school districts, and organizations interested in effective education. His research interests and learning activities currently focus on human cognition and learning, organizational change, and the use of digital technologies in education. He has extensive teaching experience in multiple disciplines at both the secondary school and college level. In addition, he has been a senior administrator at two liberal arts colleges. His current work is focused on helping colleges (especially groups of colleges) reap the maximum "learning return" on investment in digital technologies at the lowest possible cost. This leads him to focus on learning and business process redesign in all of his work.

Kyle L. Peck is an Associate Professor of education at Penn State University, and is manager of Link to Learn's Professional Development Project, a state-wide initiative to prepare educational professionals to use today's global computer networks effectively. He taught middle school for seven years, was involved in corporate training for five years, and has been on Penn State's faculty for nine years. He is co-author of two books, and several articles and educational software.

The title of his talk is "Renaissance, Version 2.0: Technology and the Near Future of Education." This is a time of unprecedented change. Education, like a riverboat emerging from a bend in the Mississippi to face rapids ahead, is in for an exciting, and perhaps perilous, next few decades. In this multimedia session, he will review what technologists are predicting and the implications these developments may have on higher education.

Pre-conference Workshops

Pre-conference Workshop I

The Online Classroom: Teaching on the Internet.

Presented by:

Sam Zahran, Instructor of English,

Jim Black, Lead Instructor, Media Integration Technology, and

J. B. Simpson, Director, Data Management,

Fayetteville Technical Community College (FTCC),

Fayetteville, North Carolina

This all-day workshop is an introduction to FTCC's Virtual Campus, including how and why they moved in this direction, with specifics on the hardware and software involved. The workshop will feature an English Composition Online Class which the participants will engage in as students. Participants will also create their own HTML syllabus. The workshop will close with a discussion of the pros and cons of online classes, issues of faculty training and compensation, and delivery methods.

Pre-conference Workshop II

Building the electronic Library: A Case Study.

Presented by:

Bill Wilson, Selection Team, Information Resources
Gettysburg College, Gettysburg, Pennsylvania

Many of our institutions have invested a lot of money on network infrastructure; we are now being asked how best to use this network to deliver additional information to desktops across campus. At the same time, there seems to be a growing frenzy amongst vendors to provide traditional library content electronically. Gettysburg is undertaking a project to design and deliver a wide range of information across our network.

This half day workshop will discuss the planning process, how we have tried to involve the faculty to help insure success, review a range of products, and let you in on how we plan to integrate these services. Lab time will be provide the participants with a chance to interact with some of the products we discuss.

About the Presenter:

Bill Wilson has given many Internet related workshops at ASCUE which have always been well attended. He has a wealth of experience in this area both from his work at Gettysburg and from several consulting engagements.

Pre-Conference Workshop III

Caught in the Web? Create a Site for Sore Eyes.

Presented by:

Susan Fleck, Associate Professor of Journalism,
Franklin College, Franklin, Indiana

Creating a Web site is a time consuming venture, so why not make sure you are getting the most mileage out of your efforts? Careful attention to design basics will ensure that your viewers are getting the message you are hoping to send.

Participants in this half day hands-on workshop will use a WYSIWYG program to design Web pages, experimenting with the use and placement of different types of graphics, colors, backgrounds and typefaces in designing a functional Web site.

About the Presenter:

Susie Fleck teaches photo-journalism, and uses computers extensively in designing attractive publications both on and off line. She has a lot of experience working with the design issues which must be solved before beginning the technical process of creating Web sites.

Pre-conference Workshop IV

Bringing the Web to the Classroom: Options for Faculty and Intrepid Bystanders

Presented by:

William Wilson, Selection Team, Information Resources, and
Martha Arterberry, Associate Professor of Psychology,
Gettysburg College, Gettysburg, Pennsylvania

Suppose that you have decided to take the plunge and join colleagues around the world who have elected to incorporate the Internet in their courses. You now find yourself asking how to do this. What issues are out there lurking? What are the keys to successful Internet use in a class? Are there results that make it worth your while?

This half day workshop will address these questions and review a number of tried and true models used to successfully integrate the Web with your courses. A faculty member who has successfully conducted two courses with the Web will provide a case study to give participants a faculty-level view of issues and solutions. Lab time will allow participants to interact with numerous exemplars of models discussed in the presentation.

About the Presenters:

Bill Wilson has given many Internet related workshops at ASCUE which have always been well attended. He has a wealth of experience in this area both from his work at Gettysburg and from several consulting engagements. He is joined by his wife and colleague, Martha Arterberry from the Department of Psychology at Gettysburg College. Martha has used the Internet extensively in her classes and will be sharing her experiences during the workshop.

Pre-conference Workshop V

Multimedia Development for Administrators and Faculty.

Presented by:

Lorinda Brader, Senior Partner with
Paragon Interactive, Archibold, Ohio.

This full day workshop will provide a hands-on opportunity to experience the creation of graphics, sound, and video using computer hardware, software, and peripherals. Multimedia terms will be defined and participants given the opportunity to use multimedia equipment to turn paper documents, photographs, and analog video into digital information. In addition, copyright issues will be discussed.

About the Presenter:

Lorinda Brader is a senior partner with Paragon Interactive, where she provides interactive technology solutions for business and education. She holds a Masters degree in Instructional Systems from Penn State and a B.S. in Business Administration. Previous positions include that of Coordinator of the Faculty Computing Support Center, East Carolina University, Greenville, NC and that of Instructional Developer with CBEL-Teaching and Learning Technologies at Penn State. She has presented several multimedia workshops at ASCUE and they were very well received.

Pre-conference Workshop VI

Creating Effective Campus-Wide Information Technology Support in the Ever-Changing World of Client Needs and Expectation.

Presented by:

Carol L. Smith, Coordinator of User Services and Computing Labs,
Depauw University, Greencastle, Indiana.

Developing effective support for information technology (IT) in today's culture is a challenging and dynamic task. While in the past IT personnel led the parade of technological demand on campuses, clients today often develop their expectations based on influences outside of our control: Commercialism, the Internet and World Wide Web, colleagues from other campuses and so on. Keeping pace with these demands is no small feat, especially when working with a fixed set of resources, including staff, equipment and budget.

This full day interactive workshop will be directed primarily at persons involved first hand in campus IT support, but interested bystanders are encouraged to attend. The topics to be covered include models of various campus-wide IT support philosophies and examples of successful (and perhaps even unsuccessful) ventures in developing specific support mechanisms, such as help desks, faculty instructional support structures and user training. Participants will acquire tools to develop strategies for providing effective IT support within their own organizations.

About the Presenter :

Carol Smith has been heavily involved with user support since 1988, when she became the sole computing support person for a department of more than one hundred staff. Since joining Depauw as Coordinator of User Services and Computing Labs, she has been responsible for providing support mechanisms for all students, faculty and staff on campus. She has presented papers at ASCUE and ACM SIGUCCS featuring the development of a help desk and a campus WWW site. She is currently part of the operations team that is developing a new faculty instructional support facility at Depauw.

An On-line Microcomputer Course for Pre-service Teachers

Mary K. Abkemeier, Ph.D.
Professor of Mathematics and Computer Science
Fontbonne College
6800 Wydown Blvd
St. Louis, MO 63105
314-889-1497
mabkemei@fontbonne.edu

Introduction:

No matter what the course description says and course objectives state we want to teach our future teachers all they will need to know about using technology in the classroom and do it all in one three-hour course! Impossible? Certainly, but there are teaching schemes that will at least maximize what a student can learn in such a short time period. Putting much of the material for our college's required computer course for educators on-line is one such scheme.

Education majors at Fontbonne College register for the course, CS 103, Microcomputer Applications for Educators. In fall, 1996, much of the material for this course was put on-line for the first time. Between fall, 1996, and spring, 1997, revisions were made based on feedback and experience from the fall semester. In fall the class met one day per week for three hours; in spring, 1997, it is meeting two days per week, Monday and Wednesday mornings. The address for this course is: <http://www.fontbonne.edu/cs103.html>.

Course Description:

This course introduces future teachers to educational applications of the computer and related technologies. It introduces them to the Macintosh computer, its operating system, ClarisWorks 4.0 and various educational and personal software packages for the Macintosh. It also provides them with the knowledge and skills of how to use the Internet as a teaching and research tool. By learning to use Netscape, students will have access to electronic course content as well as dynamic links to the variety of educational resources currently being developed on the Internet.

Course Objectives:

The student will:

- Develop specific word processing skills on the Macintosh using Claris Works 4.0
- Create and manipulate graphics within the Claris Works environment
- Create, manipulate and report using the Claris Works data base
- Produce functional spreadsheets using Claris Works
- Create slide shows using Claris Works
- Learn to integrate the various applications of Claris Works
- Explore the Internet and experience its breadth and depth while discovering the wealth of educational resources available on the Web

Study controversial topics related to educational technology, such as issues related to privacy, ethical uses of technology and copyrights

Student Background:

Most of the students in CS 103 have a sparse computer background. Some have had experience using a word processor. Few have worked with databases, spreadsheets and the Internet. Only one student out of 20 during the spring, 1997, semester owns a computer. The others use Fontbonne College's computer facilities. A majority of the students are elementary education and special education majors, while some are deaf education majors.

Initial Weeks of the Course:

Since most of the students have not had experience using the Internet, the course description, syllabus, and requirements are handed out in a printed version at the beginning of the course. The first two-three weeks of class are spent introducing them to the Macintosh operating system and familiarizing them with the Claris Works 4.0 Word Processor. Following these initial weeks, the class receives an introduction to the Internet and World Wide Web. Students learn to navigate the CS 103 Home Page and Fontbonne College's Home Page. Following this introduction they learn how to use Search Engines. Then the class settles into its weekly pattern.

The course requirements include, among other items, World Wide Web themes for the week. Each week students investigate two topics on the Web. One topic is a general educational technology topic, the second topic deals with multiculturalism and/or diversity. These topics were chosen by the instructor, however, students are told that if someone suggests a suitable replacement for one of the topics, changes could easily be made. These are the Internet topics:

	General:	Diversity topics:
1.	Assistive Technologies	Holidays (other than Christmas, etc)
2.	Apple/Macintosh	Famous People of different races, especially women
3.	Professional Organizations	Folk and / or Fairy Tales
	Journal	
4.	AUPs	Religions and Religious Customs
5.	Legal, Ethical Issues	Multiculturalism in Literature
6.	Lesson Plans	Art / Music
7.	Educational Resources	Entertainment: TV, Film, Theatre
8.	Museums, Libraries	Environmental Issues
9.	Government Agencies	Education: Gifted, Special Adult, Home Schooling
10.	Netiquette, key Pal	Family Life
	Projects	
11.	Homework Help/Hotlines	Racism, Crime

General Description of the Course:

Each Monday students are required to submit a form with two Internet addresses on it. I call this form the "short" form. One Internet address relates to the general World Wide Web topic; the second address is the one related to diversity. This form contains the student's name, the URL of the site, the site's title and the topic of the day along with a 10-15 word description of the site.

After submitting this form, students are encouraged to discuss and expound on anything they found particularly interesting. When the instructor thinks a topic is of particular importance, she insists that each student contribute to the conversation. After six weeks (twice per semester) students hand in an Internet Portfolio. The portfolio contains, in a more lengthy format, a summary of the Internet sites the students have visited during the past six weeks. Each site must have a more detailed description than on the short form. Once again, the Internet topic, the site's title and the URL must be listed. Also, the student must rate the site on Content, Organization and Aesthetics. Along with their rating they must give a brief description of each area. Students are provided with examples by the instructor. In addition, the first page of the site must be printed and submitted along with the above information.

Following the Internet discussion, students receive instructions on how to construct and use spreadsheets or databases in Claris Works, how to prepare Power Point presentations, how to create slide shows in Claris Works, how to create Draw documents in Claris Works. At times during the semester software demonstrations are given that the instructor thinks are of particular interest to the current students.

At the beginning of the class on Wednesdays, time is set aside for the "term" or "terms for the day". The instructor has chosen certain terms that she thinks the student must know as a result of taking the CS 103 course. The terms are categorized into general technology terms and Internet terms. For instance, some general technology terms included in this list are: RAM, virus, cache and motherboard; some Internet terms are: Domain Name, baud rate, flame and ftp. Prior to the week in which a specified term is discussed (More than one term per day is usually presented. Some times up to five or six may be presented if the terms "fit" together, such as RAM and ROM.) students are asked to write down the context in which they saw the term while investigating other topics on the Internet or while reading other educational materials dealing with technology. When it is time to define a term, students are asked to define it from what they have read. In case no one comes up with a suitable definition, the instructor has an acceptable definition ready to be shown on an overhead.

Following the "term" or "terms for the day" part of the class, students continue as they do on Mondays with the above list of topics or skills.

Internet Topics:

On the CS 103 page, there are addresses that the student can investigate pertinent to each assigned Internet topic. For instance, one topic the students investigate is Professional Organizations and/or Journals. URLs for professional organizations such as ISTE and AACE, among others, are listed. Students learn more about each of organizations from their web page. However, students are

encouraged to determine if a professional organization in their field is on the web instead of using the sites suggested by the instructor. If a student finds such a site, he/she is encouraged to use this site for his/her Internet site of the week.

At the end of the semester students will be offered the opportunity to purchase a bound version of all the Internet sites visited by the students in the class. This bound version will include the students' evaluations of the sites.

The diversity/multicultural sites will be listed on Fontbonne's web page along with the students' descriptions. Information will be sent to principals in the St. Louis area telling them about this list of sites prepared especially for them and their teachers who would like to have web addresses that specifically deal with diversity issues.

Main Part of the CS 103 Home Page:

After clicking on Course Content from the CS 103 web page, students arrive at the Course Content page. The subtitles under the CS 103 Course Content page (address: <http://www.fontbonne.edu/Content.html>) are:

- Claris Works and The Macintosh environment
- The Internet
- Hardware and Software
- Legal and Ethical Issues in Educational Computing
- Assistive Technologies for Special Education, Deaf Education, etc
- Professional Organizations and Journals
- Multicultural and Diversity Issues in Education

This page provides the overriding outline for the course. Since the course is offered on the Macintosh platform and uses Claris Works to teach an integrated package, the instructor wants the students to be aware of some of the Claris Works sites, such as the Claris Web Page and pages devoted to Claris Works FAQs, as well as Apple sites such as Apple Support and Apple World Wide Web Sites.

The page containing the most information and links is <http://www.fontbonne.edu/internet.html>. This page contains 11 links to topics relative to the Internet. These links are:

- History of the Internet
- The Internet Tourbus
- An Educator's Guide to the Internet in the Classroom
- Take a tour of the Internet
- The World Wide Web (WWW) - not so technical background
- Libraries, Museums and Other Agencies on the Internet
- Search Engines on the Internet
- Educational Resources on the Internet
- Sources of Lesson Plans on the Internet
- Ask Dr. Internet
- Government Agencies on the Internet

The Hardware and Software Page contains addresses of some of the major hardware and software manufacturers.

On the Legal and Ethical Issues page these topics are presented: Equal Access, Privacy Issues, Acceptable Use Policies, Computer Crime, Hackers, Software Piracy and Computer Viruses.

The Assistive Technology page contains links to sites for the deaf and hearing impaired, for the blind, for those with dyslexia, plus numerous sites for those with physical handicaps.

Journals listed under Professional Organizations and Journals are: Electronic Learning, The Instructor, TechTrends, Educational Technology and Research Development, Learning and Leading with Technology, Journal of Research on Computing in Education and T.H.E. Journal. Some organizations listed are: ISTE (International Society for Technology in Education), AECT (Association for Educational Communications and Technology), AERA (American Educational Research Association), ISPI (International Society for Performance Improvement), ASTD (American Society for Training and Development), and CCC (Computer Curriculum Corporation).

Evaluation:

In addition to the Internet assignments, students are evaluated on their ability to produce word processing, data base, spreadsheet and draw files. For each Claris Works application the student must create both an administrative and educational application. Their final project consists of using the WWW to obtain information and then using the Claris Works data base to store the information. From the data base the students create, they must demonstrate their ability to integrate data from one application to another. So they must demonstrate that they can copy some of the data into a spreadsheet and use appropriate spreadsheet techniques on the copied data, use mail merge and use the draw tool with either the word processor, data base or spreadsheet. In addition, the students create a 10-15 slide Power Point presentation illustrating something they learned from the Internet.

Conclusion:

Never before have I taught a class that seemed to be so dynamic. After each class, with each new site a student discovers, I make plans to change the CS 103 Home Page for the next semester. I am excited about the amount of knowledge the students seem to obtain for the course presented in the above format and will continue to present it in the same manner for the foreseeable future.

The Mathematics and Computer Science Learning Center (MLC)

Solomon T. Abraham
Director, Mathematics and Computer Science Learning Center
North Carolina Central University
1801 Fayetteville Street
Durham, N.C. 27707
(919) 560-6158 or (919) 560-6315
Fax: (919) 560-5012
sta@sci.nccu.edu

Abstract:

The MLC was established in the Department of Mathematics during the fall semester of the 1982-83 academic year. The initial operations of the MLC were supported by grants to the University from the Burroughs-Wellcome Company and the Kenan Charitable Trust Fund. The Center houses a Math Library, a Tutorial Lab, a Video Lab, a Computer Science Lab, and a computer lab for Critical Foundations in Arts and Sciences (CFAS). All math and computer science students use and benefit from the Center. The MLC also helps faculty members develop special tutorial programs, implement the programs, and evaluate their effectiveness. Computers and/or audio visual equipment are used in developing, implementing, and evaluating the programs.

Overview

The Mathematics and Computer Science Learning Center was established in the Department of Mathematics and Computer Science in the early 1980's as a resource and facility for providing a variety of teaching and learning support services and programs. These services and programs include:

1. developing and administering self-paced improvement programs (SIP) for students whose scores on diagnostic tests show deficiencies in mathematics;
2. providing tutorial services in mathematics and computer science courses at all levels;
3. providing review sessions for all freshman mathematics courses.

The Mathematics and Computer Science Learning Center (MLC) houses a variety of resource media materials including micro-computers, books, journals, mini-modules, CAI materials, a video library, and other learning resources. These resource materials are used by students for drill and practice exercises that give immediate feedback on mastery of a variety of mathematical rules, formula, algorithms, and techniques. The MLC and its resources are also used by the faculty as a supplementary instruction center.

The Self-Paced Improvement Program (SIP)

The SIP is offered twice a semester: once at the beginning of the semester and once after mid-semester. Three courses are involved in the two sessions of the SIP.

The focus of the first part of the SIP is to help students, who have inadequate mathematical background, to overcome their short comings as soon as possible so that they can successfully complete the courses in which they are enrolled. This program is designed to not duplicate or reproduce the regular course work, but to reinforce the pre-requisites for each course. The second part of the SIP is designed to supplement class work and class lectures. This helps improve students' comprehension of the various concepts encountered in their classes and the textbook.

Procedures for the First SIP

At the beginning of each semester (usually by the third week), all students in the Intermediate Algebra (Math 0900) and College Algebra and Trigonometry I (Math 1100) courses are given diagnostic tests to evaluate each student's mathematical preparedness to successfully complete the course in which they are enrolled. The diagnostic test questions are carefully designed to assess student's background in four general areas needed to successfully complete each course. The targeted areas for Intermediate Algebra (Math 0900) SIP are;

- (1) Whole Number Operations
- (2) Fractions
- (3) Decimals
- (4) Percents.

The targeted areas for the College Algebra (Math 1100) SIP are;

- (1) Signed Numbers,
- (2) Equations and Word Problems,
- (3) Exponents and Polynomial, and
- (4) Factoring and Division of Polynomials.

If a student scores below 70% in one or more of the areas on the pre-test, he/she is assigned to the MLC for SIP work in those areas.

Folders are prepared for each assignee and ready for use during the third week of classes. Each folder contains: (1) procedures on use of the Center, (2) assignments (modules to be done) tailored to the assignee's needs, (3) deadlines for each assigned area. Upon successful completion of all the modules for an assigned area, the student takes a computerized test before moving on to the next assigned area.

At the completion of the first SIP activity, post-tests are administered for the two courses and results of the pre-tests and post-tests are analyzed. Each SIP student's progress report specifies the number of modules completed, area test results, and pre-test and post-test results. A report is prepared for each section of Math 0900 and Math 1100.

Development of the First SIP

A committee composed of the Mathematics and Computer Science Department faculty members is responsible for the development, assessment, and improvement of the First SIP. The main charges of the committee include the following:

- * Develop appropriate test banks for the diagnostic pre-test and post-test for Math 0900 and Math 1100.
- * Develop test banks for each of the four areas for each of the two courses. There are a total of eight different test banks.
- * Customize "OMNIS" software to:
 - grade pre-test and post-test;
 - assign students who scored below the cut-off point on the pre-test to the SIP;
 - create progress sheet for each SIP student;
 - create notices and folder labels for assigned students;
 - prepare report and analysis for each section of both courses as well as an assessment of the SIP program for the session.
- * Develop four step-by-step self-taught modules for each area of the two courses. There are sixteen modules for each course.
- * Develop an effective and efficient mechanism to implement the program.
- * Evaluate and review the program every year and make appropriate changes/modifications of the software, modules, and procedures as needed.

Implementation of the First SIP

The implementation of the First SIP is carried out by the MLC Director, three faculty members with one quarter release-time each, two graduate assistants, and three upper class undergraduate student assistants. Pre-tests are graded, analyzed, and all necessary materials are prepared to start SIP work within two days of the tests. Folders with assignments for each SIP student are prepared. Inside each folder is a progress sheet with the following information:

1. Areas assigned for SIP, (it ranges from one to four);
2. Name of the modules to be completed for each assigned area;
3. Deadline for the completion of each assigned area.

All testing, analysis, and assignment schedules are computerized. Deadlines to complete each area are staggered by course section to avoid a "bottle-neck" and to use the time of students, student assistants, and faculty efficiently.

The maximum time to complete an assigned area, i.e. to complete all modules and take the area test, is one week. Thus, a SIP student may have up to four weeks of SIP assignments to complete in the MLC.

Evaluation of the First SIP

At the end of the program, the SIP's effectiveness is evaluated in two ways.

(1) Results of the pre-tests and post-tests are compared for the SIP students who completed at least half of their assigned work ("attended"). Comparison of the pre-test and post-test scores for four combined semesters. (Spring 1995 - Fall 1996), for the two courses are as follows:

The average Pre-test score for Math 0900 SIP students who completed at least half the assigned work is 55.0%, and their post-test average is 71.4%.

The average Pre-test score for Math 1100 SIP students who completed at least half the assigned work is 55.2%, and their post-test average is 72.3%.

(2) The overall course performance of SIP students who completed at least half of their assigned work is compared to those who did not attend the MLC to complete their assigned work. The results for Spring 1995 are summarized in the following graphs.

Percentage of Math 0900 Students by SIP Attendance and Course Outcome



Nearly 40% of the Math 0900 SIP students who completed or attended the MLC passed their course. On the other hand less than 10% of those who were assigned for SIP but did not attend the Center passed their course.

Percentage of Math 1100 Students by SIP Attendance and Course Outcome

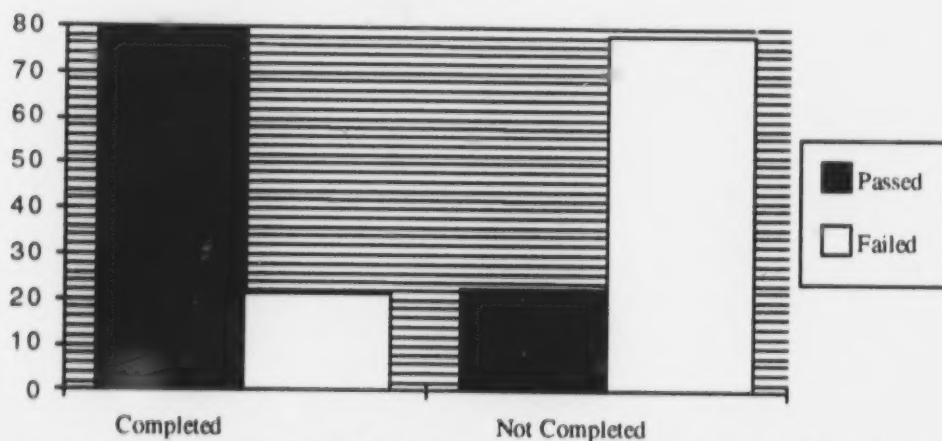


For Math 1100, fifty nine percent (59%) of the SIP students who completed or attempted their assignments in the MLC passed their course with grades of D or better. On the other hand only 25% of the SIP students who never attended the Lab passed their course.

Procedures for the Post Mid-Semester SIP

The SIP for the second half of the semester involves Math 0900 and Math 1140 (Mathematics for the Liberal Arts). Unlike the SIP of the first half of the semester, students in the two courses are assigned to the MLC for SIP based on their mid-semester grade reports by their instructors. This program gives students who earn a grade of D or less for their mid-semester report an opportunity to master specific topics and areas that have been diagnosed as weaknesses, and improve their grade. Instructors in these courses are responsible for the development of the program. This program also has its modules and testing procedures. Its implementation, analysis, and organization is carried out in the MLC by the instructors of the courses, the MLC Director, some members of the MLC Committee and student assistants. The effectiveness of this program is evaluated by comparing the overall course performance of SIP students who completed the assignment against the performance of those who were assigned but did not complete the assignment. The following two graphs summarize the results for Spring 1995.

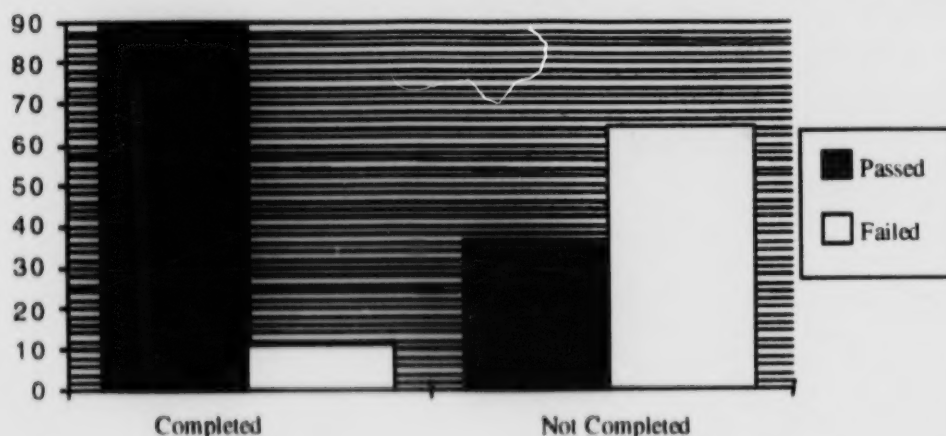
**Percentage of Math 0900 Students by Second SIP Completion
and Course Outcome**



Seventy nine percent (79%) of the students who completed their Lab work passed their course. On the other hand, only 22% of the assigned students who never attended the Lab to work on their self improvement assignment passed the course.

For Math 1140 SIP, 89.5% of the students who completed their assigned work passed their course with grades of D or better. On the other hand, less than 36% of the assigned students who did not complete the Lab work passed the course.

Percentage of Math 1140 Students by Second SIP Completion
and Course outcome



Other Services of the MLC

Some of the other services that the MLC offers students throughout the semester are as follows:

1. Tutoring is offered for all mathematics and computer science courses on a first-come-first-serve basis. The MLC is a site for the North Carolina Alliances for Minority Partnership in Sciences and Mathematics (NCAMP). Through grants from this program, the MLC trains graduate students and upper class mathematics and computer science students to help as peer tutors in the Center.
2. Courses in Intermediate Algebra, Algebra and Trigonometry, the Calculus Series, Probability and Statistics, and Finite Mathematics use the video library to supplement class lectures. Some instructors also assign use of tutorial software in their courses.
3. The Center develops final exam review materials for Math 0900 and Math 1100 and conducts coordinated review sessions for these courses each semester.
4. Individual students may schedule conferences to develop study skills, test taking skills, time management, and for other related assistance. Reading and video materials in these areas are available for students in the Center. A "Student Survival Kit" booklet that provides a quick and easy reference for students who may be experiencing academic difficulty in mathematics, or those who wish other assistance in a variety of other related areas has been prepared and given to students to be used as a reference. The booklet also contains information on services available in the MLC.

5. The Center is open from 9:00 A. M. to 10:00 P. M. Monday through Thursday, 9:00 A. M. to 5:00 P. M. on Friday, 10:00 A. M. to 2:00 P. M. on Saturday, and 2:00 P. M. to 7:00 P. M. on Sunday.

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Multimedia for the Non-Computer Science Faculty Member

Stephen T. Anderson Sr.
Associate Professor
Math/Science/Engineering
University of South Carolina Sumter
200 Miller Rd.
Sumpter, SC 29150
stevea@sc.edu

Abstract

Have you wondered how some faculty find the time to learn some of the more sophisticated multimedia presentation development software out there? On top of that, how do they find the time to re-vamp their courses utilizing the newly acquired technology? Where do they find the resources? How do they learn what works and what doesn't?

This "Tutorial" session will answer how this author did it, while teaching at an institution where a twelve hour load is the norm and even higher overloads are common. If you are considering "taking the plunge" but are not yet convinced enough to devote a whole day to a pre-conference seminar, then this 45 minute session may be just right for you.

The topics will cover:

- Describing the time commitment
- Software choices
- Hardware requirements (the necessities) -Development concerns and advice -Hardware options (the niceties)
- Storage and retrieval (Things I learned the hard way)
- How do you stay current?

We will then open it up for questions and discussion since that is often where I learn the most at ASCUE.

Introduction

I have been utilizing software packages to develop materials for the classroom since the mid to late eighties. Early attempts were limited to creating slides on acetate utilizing Harvard Graphics and could not be called "multimedia," but they did represent a change in the delivery system I was used to using. In math classes, I was on the chalkboard, and in computer classes, I usually used acetates and erasable colored pens. Even then I noticed that when I took the acetates back to the office to "wash off" that I would start to rethink my approach to some of the written material. I would reconsider the content, and sometimes I would rethink the sequence, but invariably I would wish that

I could somehow bring the material to life better through the use of support materials, motion, color, sound, etc. About the only consistent success was the utilization of "show and tell" props for hardware in the computer courses, and I continue to use those today when I can get a hold of them and make them available in the classroom (although, getting of a hold of a real supercomputer to "show off" in class is obviously out of the question. I also took advantage of the typical "dice" and "playing cards" probability examples common in many statistics and probability courses to develop actual or simulated experiments to demonstrate mathematical concepts, but the computer did make itself more of a pedagogical tool early in my teaching of statistics due to the availability of number crunching stat packages readily available to everyone, as well as the ability of even the earliest spreadsheets to perform the many tedious computations often necessary to perform the analysis. I do admit that I have not yet realized a gain in the Algebra course I am teaching now. I still am using chalk, LOTS of problems worked as a group on the board, etc. I have used e-mail and to disburse information efficiently, but I do not utilize technology to the extent that I do in my computer courses. How do you find the time?

This is one question I am invariably asked, especially as it relates to staying abreast of all the new technological advances and opportunities out there. The answer is relatively simple. I chose to make "getting up to date" a priority in my professional life and I chose which new "toys" I would play with first. In my case, since I had some familiarity with "slide show software," it was more natural for me to explore MM software in 1990-92 than it was to explore the internet, at which I had relatively little experience. I knew my computer application courses would require me to learn browsers, email, discussion lists, news groups, and other internet applications, but I had to make a conscious decision to commit to the use of a multimedia presentation package to revamp ALL my lecture material since that was definitely optional.

The first step I took in the MM adventure was to attend an ASCUE hands on workshop on the use of multimedia packages in the classroom. The class happened to utilize COMPEL, a package which was receiving very strong reviews at that time (1993). I happened that same week to locate an article on "Presentation Powerhouses" in a MM magazine and started doing some comparison shopping. At that time, the two packages (which were affordable and did not require formal scripting) which stood way above the rest were COMPEL and ASTOUND, with the latter receiving a half a star better rating. Using the old "Consumer Reports" mentality, I bought ASTOUND and I have not regretted it for one minute.

I chose one course as my target for converting materials to a MM format. The computer literacy course lent itself nicely since it did require consistency between multiple sections and its content did change very often, requiring the updating of the MM materials every time I taught it (often between classes during a 15 minute break) The problem was, while text material was readily available, the clip art and "figures" which were so badly needed to portray many of the hardware and software tool were not readily available (1993-4). At the time, text books did not yet come with pre-packaged MM slide shows. My first semester was spent creating "shows" for the literacy course using lots of text, SOME images, and very little in the way of MM power tools. It did, however, give me a series of shows which could then be revised, edited to keep up to date, and added to as far as images, sounds, animation, motion video, etc.

I took our text book and spent quite a few evenings scanning in most of the useful images on our HP

scanner, saving them in an appropriate format, and then importing them into the slide shows. This served a second purpose... I was forced to look through the text again, even though I had been using it before. It was not uncommon for me to be a little less careful during a second or third semester with a text book, believing that I knew its content already. The enforced rethinking of the topics allowed me to expand coverage where appropriate, as well as delete coverage which I noted did "not work" the way I'd have liked. Preparing a "show" requires me to generate notes, identify which diagrams and pictures I wish them to see, identify which topics need updating (since texts are behind the cutting edge before they even hit the market), and to identify which topics I simply do not wish to cover.

I estimate that the first semester required approximately 8-10 hours per week (now you can usually eliminate scanning time since most texts come with "figures on CD") in material preparation and revision. Following semesters required about half that, barring a change in text books. Every so often I will choose a module which lacks "pizzazz" and refresh it with updated pictures, full motion video, and my own digital camera images. This usually requires the original 8-10 hours per week depending of course on material availability. I liken this initial load to "teaching an extra class" and subsequent semesters with teaching a prep you have not had in a while. These situations are not strangers to most of us.

Software Choices

I happen to choose ASTOUND since at the time I was getting involved, Powerpoint was not yet nearly as powerful, and Presentation was really quite under whelming (and still is in comparison IMHO). Other choices such as Compel, Director, Toolbox, Harvard Graphics, and other authorware either were under powered, over priced, had a steep learning curve (some with scripting) or a combination of the above.

Astound 4.0 still has better features for object control than all the rest, but Powerpoint is improving all the time, and has almost caught up. I am still more familiar with Astound so it is my preferred multimedia tool. The good news is, more and more of us are almost "expected" by our students to utilize the technology where appropriate. The reason I say this is "good news" is that I usually will jump on any band wagon which I feel may leave without me (and leave me in the dust to boot!) especially when so many professionals I respect seem to be increasing their productivity as well as knowledge by joining in. The issue may not be WHICH package you choose, but more a matter of CHOOSE ONE AND GET GOING!

Hardware Requirements

Minimum configurations are based on your level of expertise and your desire to include full motion video, sound, and multitasking capabilities into presentations. If you are still budget constrained to a 486 platform, a minimum of 16 MB of RAM will make it a usable albeit a bit cumbersome environment to develop MM presentations. Remember that you are limited by the LOWEST COMMON DENOMINATOR of the platform you use to create the MM tool and the platform(s) you use to utilize to show the MM tool. Beware of the show developed on a Pentium 166 with 32 MB of RAM, a 17" screen, and a 4 MB video card -- which will then be shown in a classroom with a 486 with 8 MB of RAM, and projected through a 640x480 projection panel under less than optimal

lighting conditions.

You must have some source of video capture, whether still or full motion. Until recently, we have been limited to still capture through a scanner and publicly available graphics files available through text books, the internet, friends, software packages, etc. I recently have added a digital camera to my tools and soon will install a video capture board on a system at school. Of course, we always have been able to PLAY full motion video (somewhat choppy on our old 486-33's before 1996) and they are becoming more and more available through text book publishers as prt of the bundled instructor materials.

My office currently has a 586-133 with 16 MB RAM (which I increased to 32 MB at my expense) and very inexpensive speakers and sound card (JUST enough to be heard). The classroom is being updated with Pentiums as this conference proceeds, so until recently I utilized my Pentium 133 notebook system with 32 MB RAM to play my MM shows. The library is also upgrading (they were 386's) so they caused a problem in posting MM shows on their systems until recently. We do have the main lab and the computer classrooms in the library which have always had systems capable of playing the MM shows.

Hardware Niceties

The most interesting recent addition has been the digital camera I purchased. It has opened up whole new horizons of possibilities regarding the capture of images which are copyright free and exactly what I want to show. For example, I always felt that a computer literacy student should see the inside of a computer, and see what a circuit board looks like with the connectors to the disk drives and video cards, etc. I used to bring in a case, usually of a system which CSD was working on at the time or a system I could get my hands on quickly and return quickly. The problem was that the classroom suddenly moved away from CSD and getting systems to and from class was a royal pain. Instead I utilized "pictures" out of our text which I scanned in. That was a good alternative, but did not always show all the "bells and whistles" I wanted them to experience. The digital camera allows me to get closeups of WHATEVER I can get a hold of and insert them into y MM presentation without worrying where the system was going to come from or how it would be returned, etc.

Another real nice add on is an external portable storage device like my ZIP drive. It allows me to transport 100 MB of "shows" and resources on a single disk. The only trick of course is that all systems need to have a ZIP drive or at least one system connected to a network need a zip drive so you can transport it to a network drive from home (without FTP'ing). I do most of my development work on my notebook, and I save the work on my hard disk as well as a ZIP drive. When I go to play it, I either bring my notebook, or I upload the file through the ZIP drive in my office machine. I used to use a parallel port version, but recently changed to the SCSI version due to its faster throughput time. It also makes a very nice medium to develop and upload home pages to the web server at school. I do not suggest "playing" the MM show from a parallel port ZIP drive as I have had some minor bottleneck problems when I tried. I did not have that problem with the SCSI ZIP drive, BUT the SCSI drive requires a special adapter card to be installed in each system whereas the parallel port version hooks up to any printer port.

I also experienced some early difficulties displaying full motion video from an 3x CD-ROM player,

but that technology is much better now and should not present a problem. Any Pentium based machine should display motion video at an ample playback rate, even when more than one program is running (often the case in my literacy class) as long as there is at least 16 MB RAM (32 MB is recommended as noted earlier) and a CD-ROM which is 4x or better (it is hard to find them that slow these days!)

Storage and Retrieval

One of the important tips I can give you regarding minimum configurations involves disk space. If you must transport your MM show, you must either be certain that ALL resources are self contained in the show (requiring LOTS more disk space) or that the resources are located in the exact same locations (disk drive designators and path specifications for example) as they are at the development work station. I had some trouble with two different machines, one of which called my ZIP drive D:, and the other E:. I also found out that the "mappings" of network drives often change as I move from my office (where the public drive is Q:) to the classroom (where the public drive is H:). If I keep shows totally self contained, I do not have that problem, BUT I do have the responsibility to be sure the show is where it is supposed to be when it is supposed to be there, and that I do not hog all the public disk space. As disk space has become so inexpensive, this is less of an issue today than it was just two years ago. I also utilize my ZIP drive to minimize these problems of storage and retrieval. The only thing I need is either a parallel port ZIP drive, or I need to be sure that the SCSI adapter is installed in the machine I will be using. I still prefer, as time permits, to make a temporary subdirectory on the C drive and transfer the MM show to that subdirectory to play it from the faster hard drive. I can then erase it from the host hard drive if need be. I found early on that having different versions of a show on three different locations is inevitable unless you centralize on ONE main form of storage--a ZIP drive in my case.

How Do You Stay Current?

This may perhaps be the most frustrating part of the MM and internet craze. I vividly remember just a few years ago wondering what a few of the ASCUE members were talking about when they said WWW and feeling like a dinosaur (techno-saur?) in an instant. I also remember putting slides onto expensive transparency acetates and getting frustrated how long color output took to produce with plotters, and even more frustrated how many times the slide would have to be redone due to updated material. I used the same acetates over again since they were so time consuming to change and reprint, and therefore could not put anything on them which would change too rapidly. Think what that means in a computer literacy class!

The advice I have is to keep attending conferences like ASCUE, The Association for Applied Interactive Multimedia (AAIM) in Chatanooga this July, the Higher Education Network Association (HENA) in SC in October, EDUCOM, and others. Having a critical mass on your campus is nice, but for those of us on very small campuses where the faculty are slow to jump on the MM and internet bandwagon, we have to find our critical mass through other professional associations at conferences and on line. A Net Search using the word multimedia found 459,722 sites, a Yahoo search located 61 categories and 5,430 sites, while an Alta Vista search found approximately 4,000,000 documents containing the word. Talk about critical MASS...

When all is said and done, the only hope you have is to:

1. not get up tight that many are doing more than you
2. not get flustered when the hardware/software does not act as planned (have a backup activity)

Achieving Continuous Improvement: Theories that Support a System Change

Donald Armel, Ph.D.
Department of Instructional Technology
Georgia Southern University
Statesboro, Georgia 30460-8046
phone: 912-681-5167
e-mail: donarmel@gasou.edu

Abstract

Focusing on improvement is different than focusing on quality, quantity, customer satisfaction, productivity, etc. If an organization desires to choose a new focus, achieving the goals of that focus requires an understanding of some basic organizational theories.

The theories of socio-technical organizational design are common to Deming's 14 points to quality, total quality management, re-engineering, and continuous improvement. This presentation will highlight basic organizational theories that are key to successful changes in work structures and goals. Targets for change will also be listed as beginning points.

An axiom: The only thing constant is change.

There seems to be agreement that in order to improve change must occur, but what to change? Traditionally, whenever a problem arose it would go through the process of being identified, and then treated in isolation from all other departments or functions of an organization. Experience has taught us that this method of effecting change not only does not work but may only serve to aggravate the problem further.

Open System Theory

Ludwig Von Bertalanffy encourages us to take the broadest view of how to change by suggesting that organizations are like living systems. The Open System Theory suggests that the relationship of living systems to their environment is similar to the relationship of organizational systems to their environment (social, business and technical) (Schein, 1985).

Approaching organizations from a systems point of view means that they will be seen as arrangements of interrelated parts open to influence from the outside world. The term interrelated means that there are many and complex connections among the parts of the system. Arrangements means that the connections are not haphazard, but planned and intentional. The idea that organizations are open to influence from the external environment is not necessarily new, but the idea of using it as a source for problem solving is.

What happens to an organization does not end at the building walls or the property fence. Much like viruses attack living systems, organizations become sick due to external forces too.

Change the System

"All organizations are perfectly designed to get the results they get. To get better results, you need to improve the design on the organization." Arthur Jones (Hanna, 1988, p. 38).

Organizations are typically performing at their maximum level, no matter how high or low that may be. Solving problems within the existing structure only results in minor improvements. If significant improvements are desired, then the system's arrangements (organizational design) must be altered to allow the system to perform at a higher level.

Using the Open System Theory, improvement and changing the arrangements should not be limited to the internal structure, but should also be made in the way the organization relates to its external environment.

Problems in an organization, even small ones, are affected by the system and in return affect the system. So to make effective change, all the persons who have an interest in seeing the problem solved, internal and external persons, should be represented in the change process. The system, meaning the way all the parts are connected, is the target for change. Deming's second point of his 14 management method points is to adopt a new philosophy, and after all, the approach taken to design organizations is based on management philosophies. So changing the system is really changing our view of how organizations should be arranged.

In stating this second point, Deming is fairly strong with his words,

Structures have been in place in management that will have to be dismantled. They have not been suitable for two decades. They never were right, but in an expanding market you couldn't lose. The weaknesses showed up when competition came in. We will have to undergo total demolition of American style of management.

Management offered all kinds of excuses. There was every kind of thing in this world, except the awful truth that Americans were beaten. Where they have been beaten is in the management (Walton, 1986, p. 59).

Large System Change Beginning Points

There is no one best place to begin to change a system. Finding the starting point is difficult and requires a considerable amount of data gathering and analysis. This analysis is done in an effort to assure that there is a match between how to change and what the organization is ready to do. Choosing the proper point can be critical to the success of the total change process. Change can begin with:

- the top management team,
- a pilot project that works within the current system,
- ready subsystems, intact groups that are more receptive to change, -hurting subsystems, groups whose problems are so painful that almost any change is better than the current situation,
- the reward system,
- training and education, or
- creating a critical mass in the employment population to be receptive to change (Beckhard, 1978).

Summary

All events, processes, problems and successes are integrally linked to each other. To affect one is to affect all. Unlike organizational theories of the past, parts of organizations cannot be taken out like parts of machines, repaired or replaced and then put back in. In theory, the dynamic effect of relationships and events will eventually reach every aspect of an organization expanding like the ripples from a pebble tossed into a pond. The choice is to manage the arrangements so that the waters are smooth, or chaos and turmoil can take over and create unnavigable passages. Through which organization would you rather paddle your canoe?

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Two Model Dual Degree Programs in Computational Science for Small Universities

Gary M. Brady
brady@sci.nccu.edu
Russell J. Gosnell
rjg@sci.nccu.edu
Manuel Keepler
keep@sci.nccu.edu
Laura B. Smith
lbs@sci.nccu.edu

Department of Math and Computer Science
North Carolina Central University
Durham, North Carolina 27707

Section 1: Introduction

North Carolina Central University (NCCU), one of the first state-supported liberal arts college for Blacks, is now one of the 16 constituent institutions of the University of North Carolina. Since its founding, NCCU has emphasized leadership and community service; consequently, it is among the top 10 baccalaureate institutions of U.S. Black American Ph.D.'s (Simmons & Thurgood, 1995). In keeping with its leadership role and dedication to community service, NCCU is addressing the difficulty college graduates often face in using their majors to serve the community.

Today, obtaining the solution to a problem often requires using people who are knowledgeable in more than one field (Arney, 1997). People with such knowledge reduce problems that arise from lack of mutual comprehension and lessen communication delays. A few multi-faceted people can solve a problem more efficiently than a larger group of specialists (Johnson & Johnson, 1994). Yet many of today's college graduates have little interdisciplinary experience (Arney, 1997).

Two major factors appear to contribute to the one-dimensionality of most graduates. One is the current trend of requiring more and more courses in the major department, which leads to isolation from related fields. The other is an outdated liberal arts core which has not changed much in the last century (Goodchild & Wechsler, 1947).

NCCU is addressing both of these situations through a new core called Critical Foundations in the Arts and Science (CFAS). CFAS (detailed in Section 2) indoctrinates students to interdisciplinary study through interdisciplinary courses. It also facilitates subsequent interdisciplinary study by being brief enough to allow students to complete two majors. Two dual-degree programs in computational science arise naturally in this setting and provide models for small universities. (Computational science is a methodology for solving problems by using modeling and simulations, data collection, and analysis of large data sets or large calculations.) One is a double

major in computer science and mathematics (detailed in Section 3) and the other is a double major in computer science and physics (also detailed in Section 3).

In the case of computer science and mathematics, interdisciplinary labs (detailed in Section 4) promote the double major by keeping students aware of the relationships between the two programs. Shared resources also make accreditation by the Computer Science Accreditation Board (CSAB) obtainable, and this, in turn, attracts students. Motivation to accept the challenge of the double major (detailed in Section 5) is provided by the lives of Black mathematicians, scientists, and engineers.

Section 2: Indoctrination

The new core was designed by first identifying goals and then designing interdisciplinary courses to accomplish them. The result is believed to provide a better foundation for today's college graduate than does the traditional collection of courses from various disciplines. The interdisciplinary approach of many of the courses not only has the advantage of showing students the interrelationships of many disciplines, but also delivers the material more efficiently, so that the total hours required (41) is fewer than those required for the traditional core (55). The development and implementation of NCCU's new general studies program, CFAS, is one of the primary factors in facilitating and encouraging double majors.

The CFAS program was designed to be a core curriculum for the twenty-first century which would prepare our baccalaureate students to be leaders in a world of cultural diversity, information technology, and interdisciplinary awareness. More precisely, the program has the four basic goals of 1) providing sufficient breadth of knowledge relating to the human experience to facilitate effective functioning in this global information society; 2) providing opportunities for students to develop skills necessary to succeed in academic, professional, and social environments and to facilitate life-long learning; 3) providing the basic skill and knowledge necessary to acquire and process information using traditional and electronic media; and 4) providing specific cultural exposure for NCCU students. CFAS achieves these goals through five academic components consisting of Communication Skills, Proficiency in Mathematics and Science, Cultural Foundations, Arts and Humanities, and Personal and Social Development. This program also is characterized by four underlying themes of writing, critical thinking, global focus, and integrative learning. Additionally, community service through service learning and cultural exposure through lyceum, forum, and campus arts presentations are an integral part of the CFAS program.

The CFAS program is in a large part responsible for giving our students the flexibility to pursue a double major, to minor in one or more areas, or to take a wide variety of electives, complementing and enhancing their professional preparation. The interdisciplinary foundation of CFAS, followed by strong advising linking academic components, ensures that our students become aware of the disciplines and courses that are most suitable for their career opportunities. CFAS is integrated into the entire learning experience and thus affords each student the opportunity to directly contribute to the design of the best career preparation that our university can offer.

The 41 semester hours are distributed over the five units as follows: Communication Skills (15 hours) consists of one year of composition, one year of a foreign language, and one semester of

speech. Proficiency in Mathematics and Science (7 hours) consists of one semester of mathematics with a technology component and one semester of science emphasizing the scientific method. Cultural Foundations (7 hours) consists of one semester of society, behavior, and spatial organization and one semester of world societies. Arts and Humanities (6 hours) consists of one year of the aesthetic, historical, cultural, and social foundations of literature, theater, music, dance, visual arts, philosophy, and religion. Personal and Social Development (6 hours) consists of three courses presenting personal financial management, family systems, career development, physical and mental health issues, ethics and values, leadership roles, disease prevention, health promotion, and CPR training.

Section 3: Sample Double Majors

Double majors are possible for any combination a student desires. None of the special arrangements that have traditionally been required to obtain a double major are needed. Traditionally, to obtain a double major, the departments involved have had cross-listings of courses, agreements about equivalencies of courses, and/or special arrangements regarding electives. With CFAS, there is simply time to complete two majors. So any combination of majors is possible, regardless of whether the departments have special arrangements. Also, any major can be combined with any two minors.

To illustrate the possibilities, Table 1 represents a degree plan for students who are interested in computer science, mathematics, and statistics. The plan includes 25 courses for 77 credit hours. These 77 credit hours combined with the CFAS 41 credit hours leave 6 credit hours of electives to obtain the 124 hours needed to graduate.

Table 1. A double major in computer science and mathematics plus a statistics concentration.

Mathematics plus Statistics	Computer Science	Course Number	Course Name	Semester Hours
x	x	MATH 2010	Calculus I	5
x	x	MATH 2020	Calculus II	5
x	x	MATH 2400	Introduction to Statistics	3
x	x	MATH 3410	Numerical Analysis	3
x	x	MATH 3800	Discrete Mathematics	3
x	x	MATH 4410	Linear Algebra I	3
x	x	COMP 1510	Programming I	3
x	x	PHIL 2300	Logic	3
x	x	PHYS 1310	General Physics for Science I	3
x	x	PHYS 2310	General Physics for Science II	3
x	x	PHYS 2410	Lab I	1
x		MATH 2500	Statistical Methods	3
x		MATH 2030	Calculus III	5
x		MATH 3020	Differential Equations	3
x		MATH 4210	Probability & Statistics I	3
x		MATH 4220	Probability & Statistics II	3
x		MATH 4920	Senior Seminar	3

x	COMP 1520	Programming II	3
x	COMP 2810	Data Structures	3
x	COMP 3300	File Processing	3
x	COMP 3610	Hardware I	3
x	COMP 3710	Computer Graphics	3
x	COMP 4810	Advanced Data Structures	3
x	COMP 4830	Programming Languages	3
x	COMP 4850	Operating Systems	3
x	COMP 4920	Senior Seminar	3

Table 2 represents a degree plan for students who are interested in both computer science and physics. This plan includes 33 courses for 102 credit hours. CFAS adds 41 hours for a total of 143 hours, which can be accomplished by taking 18 hours per semester for four years.

Table 2. A double major in computer science and physics.

<u>Computer Science</u>	<u>Physics</u>	<u>Course Number</u>	<u>Course Description</u>	<u>Semester Hours</u>
x	x	COMP 1510	Programming I	3
x	x	MATH 2010	Calculus I	5
x	x	MATH 2020	Calculus II	5
x	x	PHYS 1310	General Physics for Science I	3
x	x	PHYS 2310	General Physics for Science II	3
x	x	PHYS 2410	Lab I	1
x		MATH 3800	Discrete Mathematics	3
x		MATH 4410	Linear Algebra	3
x		PHIL 2300	Logic	3
x		COMP 1520	Programming II	3
x		COMP 2819	Data Structures	3
x		COMP 3300	File Processing	3
x		COMP 3610	Hardware I	3
x		COMP 3710	Computer Graphics	3
x		COMP 4810	Advance Data Structures	3
x		COMP 4830	Programming Languages	3
x		COMP 4850	Operating Systems	3
x		COMP 4920	Senior Seminar	3
	x	PHYS 2320	General Physics for Science II	3
	x	PHYS 2420	Lab II	1
	x	PHYS 3060	Electricity and Magnetism	3
	x	PHYS 3210	Lab III	2
	x	PHYS 3110	Mechanics	3
	x	PHYS 3220	Lab IV	3
	x	PHYS 3310	Modern Physics	4
	x	PHYS 4110	Statistical Mechanics	3
	x	PHYS 4220	Mathematical Methods	3

x	PHYS 4300	Introduction to Quantum Mechanics	3
x	CHEM 1100	General Chemistry I	5
x	CHEM 1200	General Chemistry II	5
x	MATH 2030	Calculus III	3
x	MATH 3020	Differential Equations	3

Section 4: Promotion of Interdisciplinary Study

Shared labs keep the mathematics and computer science majors very aware of the content of the courses in the two programs, and thus of the relationships between them. Shared labs also make accreditation by the CSAB obtainable, and accreditation makes participation in the program attractive because of almost guaranteed employability.

NCCU is aware of how important it would be for the Computer Science degree program to receive accreditation and is dedicated to achieving this goal. We are currently using as a guide the criteria of the Computer Science Accreditation Commission of the CSAB. We are fortunate that our campus has an extensive campus-wide network consisting of fiber optic connections between each building on campus and our library, which is the hub of our network, and at least one network connector in virtually every room on campus. This, along with grants from the Kenan Foundation, IBM, AT&T, and Title III, has allowed us to build a substantial infrastructure within our department.

One major component of this infrastructure is our AT&T Computer Science Lab consisting of 20 PCS connected to a UNIX server running LanManager 2.01a, using the campus network hardware. This lab is used by computer science, mathematics, and physics majors for programming on an open-shop basis. Adjacent to this lab is our Mathematics Learning Center's multimedia/audio-visual lab, consisting of 10 multimedia PCS connected to our campus network with full Internet access using Netscape and LAN Workplace software. In addition to these two labs, we have a computer classroom, used for teaching computer science classes as well as mathematics classes that are enhanced by using electronic technology. In this facility we have 26 PCS and a Novell-based server which provides connections to our campus network and the Internet for each of these machines. Our faculty also have access to the Internet, as each office, workroom, and classroom has at least one network connection. Each of these computers has a variety of software, including DOS/Windows, C++, Pascal, MASM, FORTRAN, Netscape, MAPLE V, Paradox, QuattroPro, and others. With these facilities, we believe that we can satisfy the criteria of the CSAB in the equipment area.

With the introduction of a new theory of computer science course into our current computer science curriculum (See the current curriculum in Table 1 or 2), we believe that we can satisfy the criteria of the CSAB in the curriculum area as well. The new course has been designed and we have faculty who are prepared to teach it.

This leaves the area of personnel, which is the area in which we must improve the most. At present, we do not have a faculty member with a PhD in computer science. We do, however, have four faculty members, with PhDs in mathematics, who teach most of our computer science courses. Two of these persons have had 10-20 hours of graduate computer science courses at UNC-Chapel

Hill, and the other two have had 30-33 hours of graduate computer science courses at the same university. Also, we have one faculty member who has completed all the course work for a PhD in computer science at Duke University. If we can attract one or two computer science PhDs to complement the faculty we already have, we believe that we will have the faculty needed to satisfy the CSAB criteria in the area of faculty.

Finally, in terms of personnel, we will need to acquire non-teaching personnel to administer our network servers and manage our hardware and software. This is currently done by faculty who also teach four courses per semester. We believe very strongly that, if we can improve our personnel situation, we can qualify for CSAB accreditation in the near future.

Section 5: Motivation: Black Mathematicians

When young people see that someone who looks like them has achieved success and fame, then they begin to have hope that they, too, can achieve similar success or their own personal goals. Consider, for example, the number of young males, especially Black males, who aspire to be like Michael Jordan. Young Black females are now dreaming of becoming another Dominique Dawes. These people achieved fame and have been in the spotlight often enough for young people to want to emulate them.

If these same youth were to learn of Black mathematicians who had achieved fame, then they possibly would aspire to become a great mathematician. Consider the pride a Black student feels when he or she studies a theorem and then discovers that it has been named for a Black person. Or consider this same person using a mathematics textbook as a course text or as a resource, only to discover that it was written by a Black mathematician. When students read about David Blackwell or Albert Bharucha-Reid, they can learn about the obstacles they overcame to become two outstanding statisticians (Smith & Keepler, 1997) and realize that they also can overcome any hurdles they might face to achieve their own goals. Future scientists will be interested to learn about William Lester (Jacobsen, 1995), who is a leading researcher in computational chemistry, or Shirley Malcom, Head of the Directorate for Education and Human Resources Programs of the American Association for the Advancement of Science, who is an expert in ecology (Prestwidge, 1996). The achievements of many other Black scientists and mathematicians serve as inspiration to our students.

To capitalize on the power such role models have to motivate students to succeed, short biographies have been written of several Black mathematicians and are kept on file in the Mathematics Learning Center. Assigned readings in the first two calculus courses, as well as in the history of mathematics course, direct students to these biographies. Appendix C contains the identities and brief descriptions of some of these.

Section 6. Conclusion

Now, more than ever, there is a demand for a group of professionals who are familiar with two or more disciplines. NCCU has found a way to address this need through a compact interdisciplinary core. Mathematics and computer science promote the double major by sharing resources and motivate students to seize the opportunity by providing role models through reading assignments concerning the lives of Black mathematicians, scientists, and engineers.

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Appendix A
Top producers of Black scientists

HBCUs historically have been and still are the prime producers of Black scientific talent in the United States (Simmons & Thurgood). Pearson and Pearson (1985) report that 87 percent of Black scientists received their undergraduate degrees from HBCUs. They also show that HBCUs are the top producers of Blacks who receive their PhDs in science. The following is the ranking of the top 10 producers of Black PhD natural scientists.

<u>Institution</u>	<u>Rank</u>
Howard University	1
Morehouse College	2
Virginia State University	3
Morgan State University	4
Tuskegee University	5
Fisk University	6.5 (tie)
Virginia Union University	6.5
Prairie View A&M University	8.5 (tie)
Tougaloo College	8.5
University of Arkansas (Pine Bluff)	10.5 (tie)
Hampton University	10.5

Appendix B Top producers of Black PhDs

HBCUs are the leading U.S. baccalaureate institutions of U.S. Black PhDs. The following are the rankings of top institutions from which Blacks who received their PhDs, 1990-1994, received their undergraduate degrees.

<u>Institution</u>	<u>Rank</u>
Howard University	1
Spelman College	2
Hampton University	3
Tuskegee University	4
North Carolina A&T State University	5
Wayne State University	6
Southern University-Baton Rouge	7
North Carolina Central University	8.5 (tie)
Florida A&M University	8.5
South Carolina State University	10.5 (tie)
Jackson State University	10.5

Appendix C Some legendary Black scientists/engineers

Most people associate the Black man's contributions in science and engineering with the achievements of Benjamin Banneker, who helped design the street layout of Washington, D.C. and wrote the plans for the city, or with George Washington Carver and his important contributions to agriculture and industry, or with Dr. Charles Drew's discoveries in the field of blood plasma preservation. However, these exceptional scientists are only three of literally dozens of Blacks whose genius has contributed to the social and economic welfare of our society through their achievements in science and engineering. In addition to Blackwell and Bharucha-Reid, other mathematicians and scientists have made significant contributions to their fields (Smith & Keepler).

Some of the legendary inventors that our students read and learn about include:

Elijah McCoy--born in Canada of runaway slaves; invented the automatic lubrication for steam engines (fed oil to machinery while it was still running); the reference for "the real McCoy."

Jan Matzeliger--born in Dutch New Guinea; invented the first machine for mass-producing shoes.

Granville T. Woods--earned 35 patents for electro-mechanical devices, bringing about improvements in telegraphy, telephones, automatic cut-offs for electrical circuits, and electric motor regulators; called the "Black Edison."

Lewis H. Latimer--invented inexpensive cotton-thread filament which made electric light practical for homes.

Garrett A. Morgan--invented first automatic stop light; invented a smoke inhalator mask.

Norbert Rillieux--born a slave in New Orleans; invented a vacuum evaporator for turning cane juice into white sugar crystals (his process is still used throughout the sugar industry today).

Lewis Temple--blacksmith; invented movable harpoon head which revolutionized the whaling industry (the Temple Toggle was the most important single invention in whaling history).

Frederic McKinley Jones--invented a removable refrigeration unit that transformed the food transport industry; was awarded more than 60 patents, including portable x-ray machines and sound equipment techniques for motion pictures.

Otis Boykin--invented the control unit in artificial heart stimulators; invented an electrical device used in all guided missiles and in IBM computers.

Meredith Gourdine--was a pioneer in energy conversion; invented many products and processes based on the use of electrogas dynamics technology.

Rock Hill Business, Education, and Community Online Network

Alan Broyles
Director of Information Services
York Technical College
452 South Anderson Road
Rock Hill, South Carolina 29730
phone: (803) 327-8031
fax: (803) 327-8059
broyles@a1.york.tec.sc.us

The BEACON network is designed to support development and implementation of demonstration applications operating in an ATM (Asynchronous Transfer Mode) fiber optic network environment. Initial origination/destination sites include Northwestern High School, Rock Hill High School, Winthrop University, and York Technical College in Rock Hill, and possibly Ft. Mill High School. These entities will partner to develop and implement applications such as:

- Distance learning classes
- Faculty development seminars
- Computer network access and interlibrary access
- Teleconferencing
- Health, drug abuse, and community health programming

Network installation and operating cost will be borne by Rock Hill Telephone Company for a period of 12 months. Site development, two-way video equipment installation and operating costs, as well as application development cost, will be borne by Rock Hill School District 3, Winthrop University, Ft. Mill High School, and York Technical College. Each of these entities will be responsible for developing and maintaining their own distance learning facilities.

Goal:

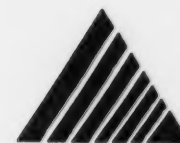
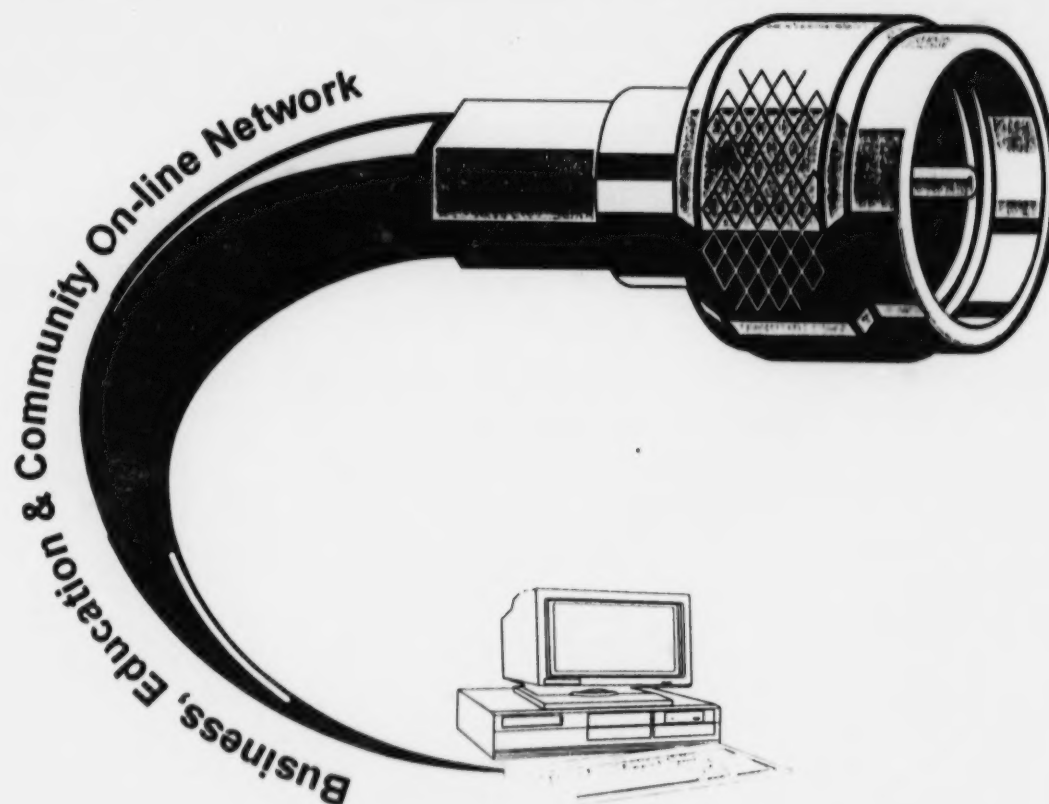
To link various public and private sector entities together with a 21st century telecommunications infrastructure providing a portfolio of information services and interactive telecommunication facilities to individual citizens from all socio-economic strata, government agencies, education systems, health care systems and businesses.

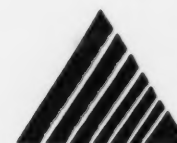
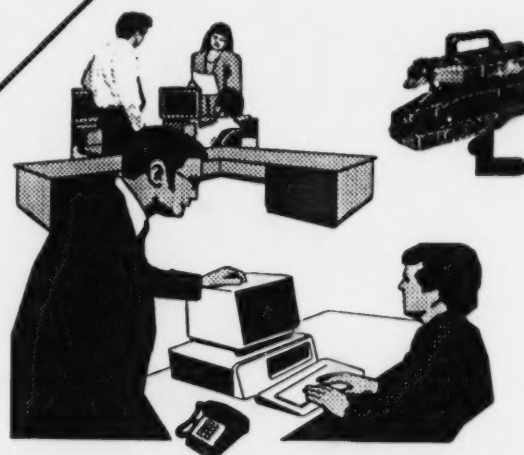
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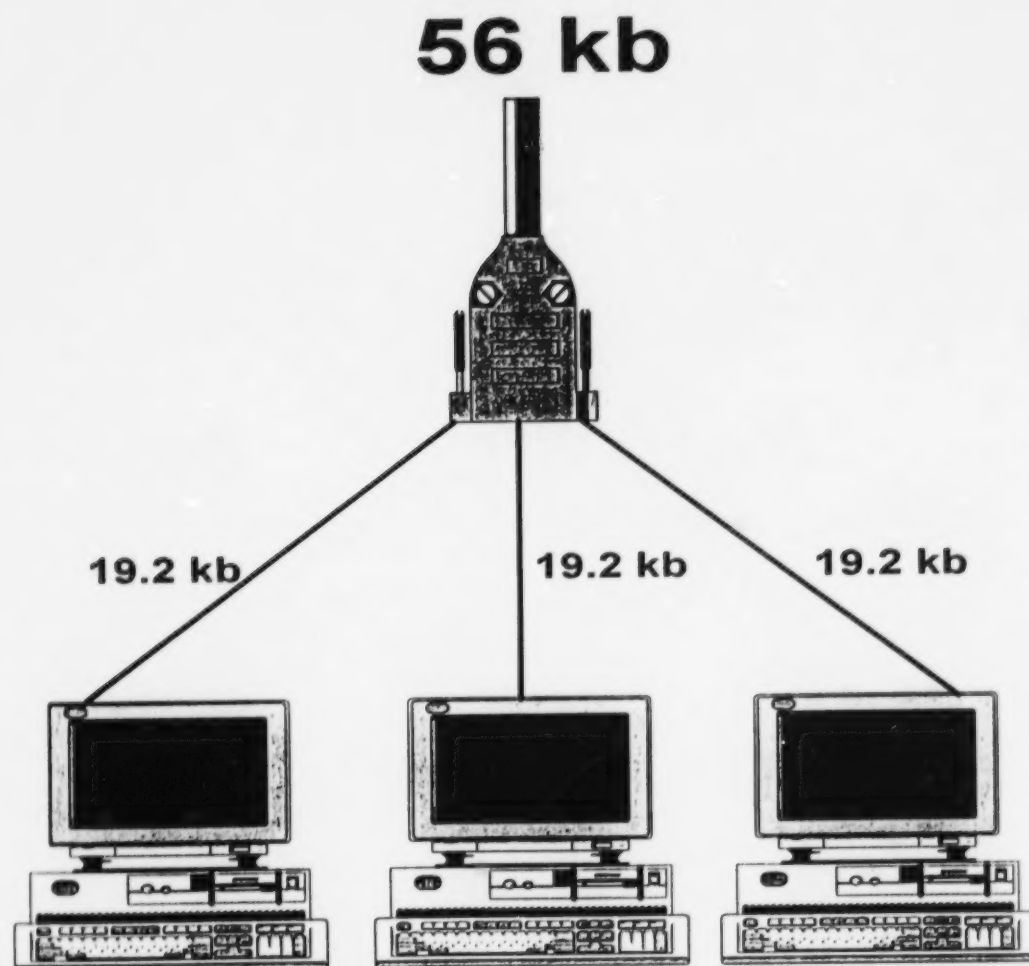
- Assure community-wide access and participation
- Focus on interaction between people
- Tailor applications for each user segment
- Implement in a timely manner
- Expand to connect other communities regionally and state-wide

(Editor's Note: The following pages include slides from the author's power point presentation.)

BEACON

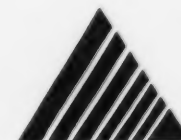






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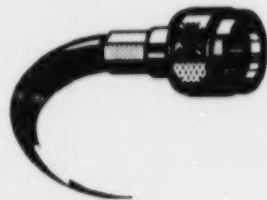
The Technical Edge



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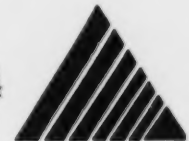


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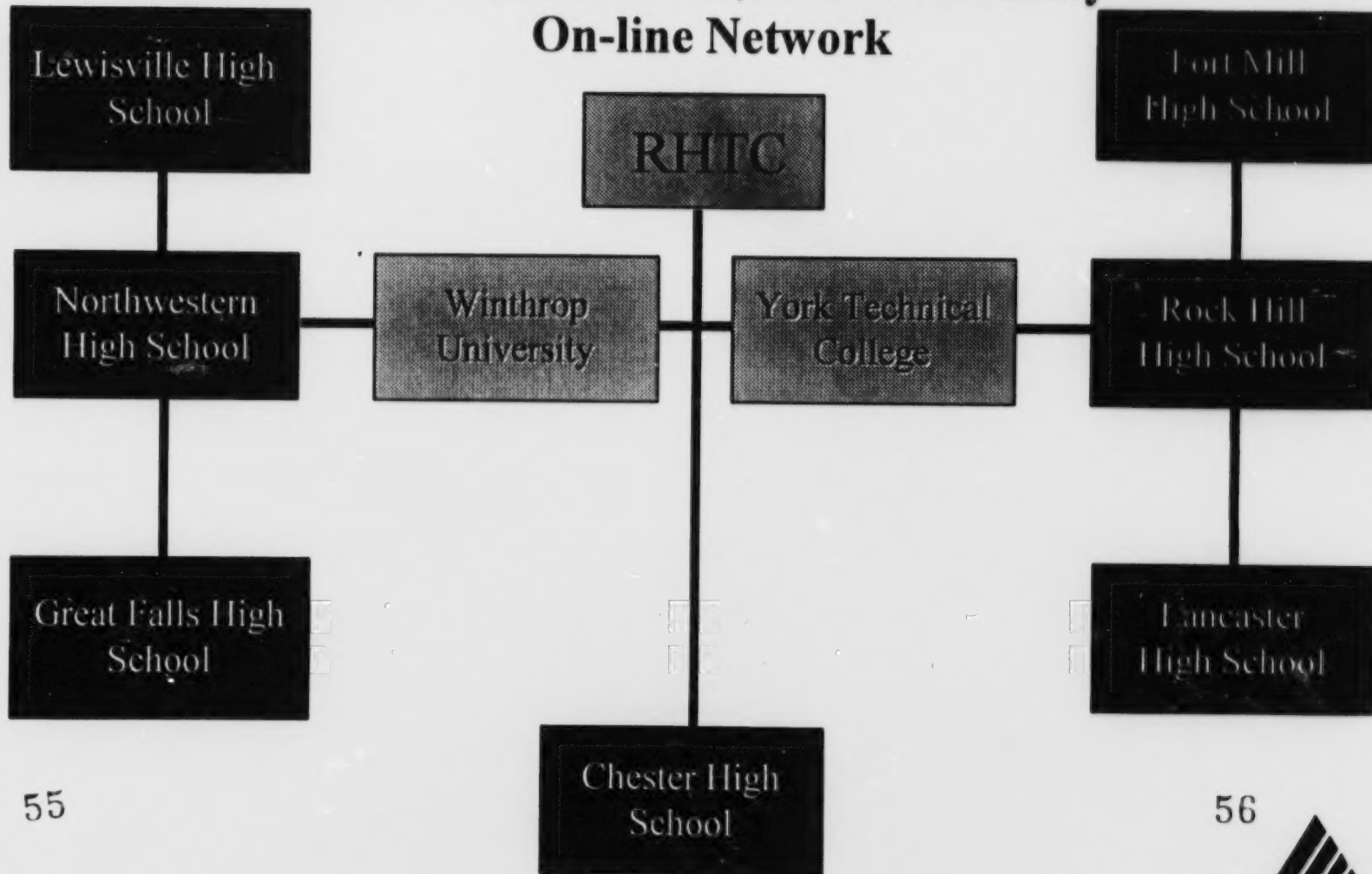
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Unlimited users



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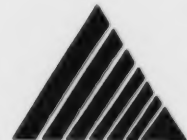
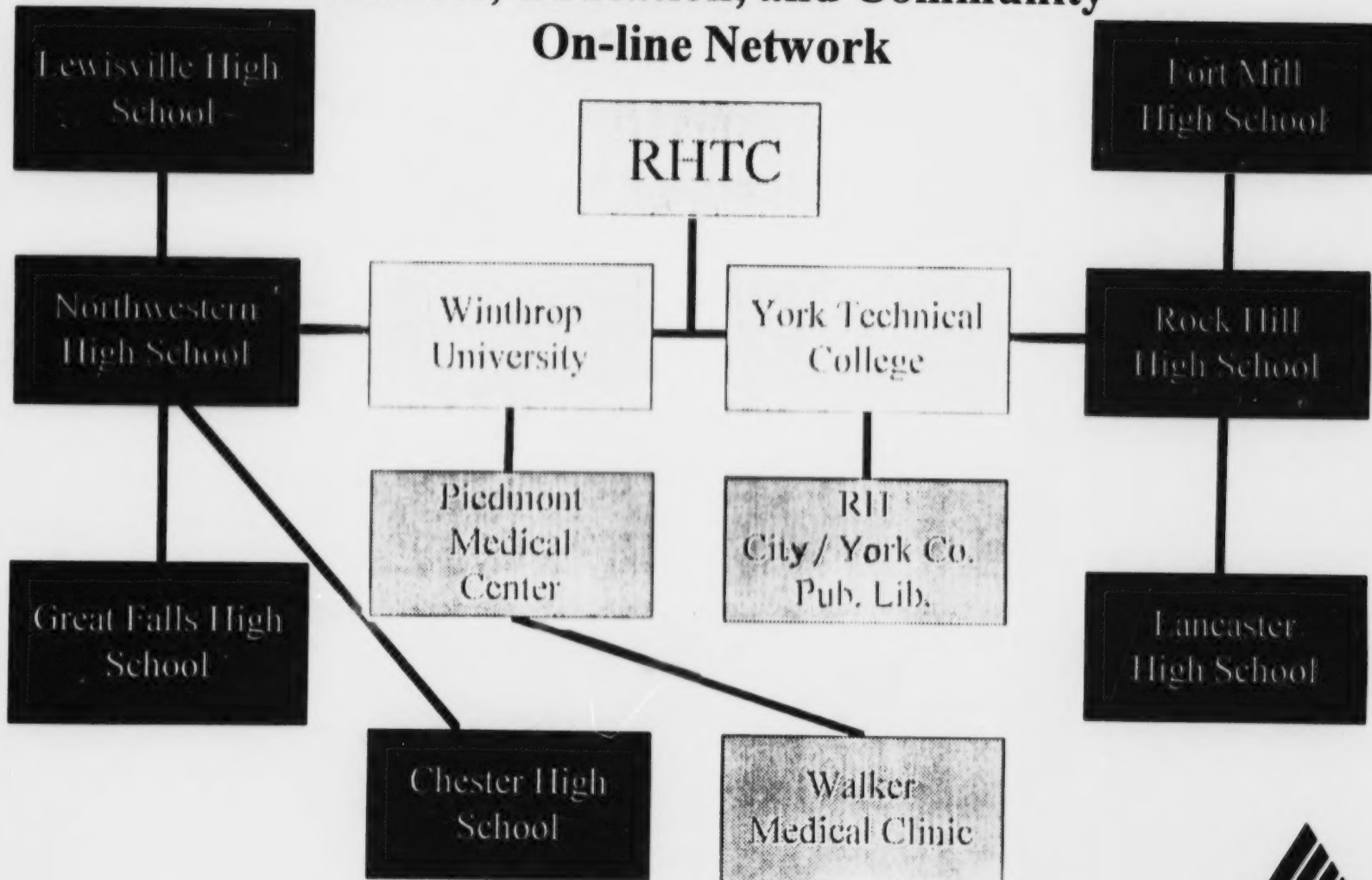
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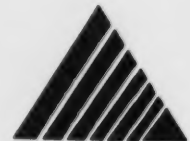
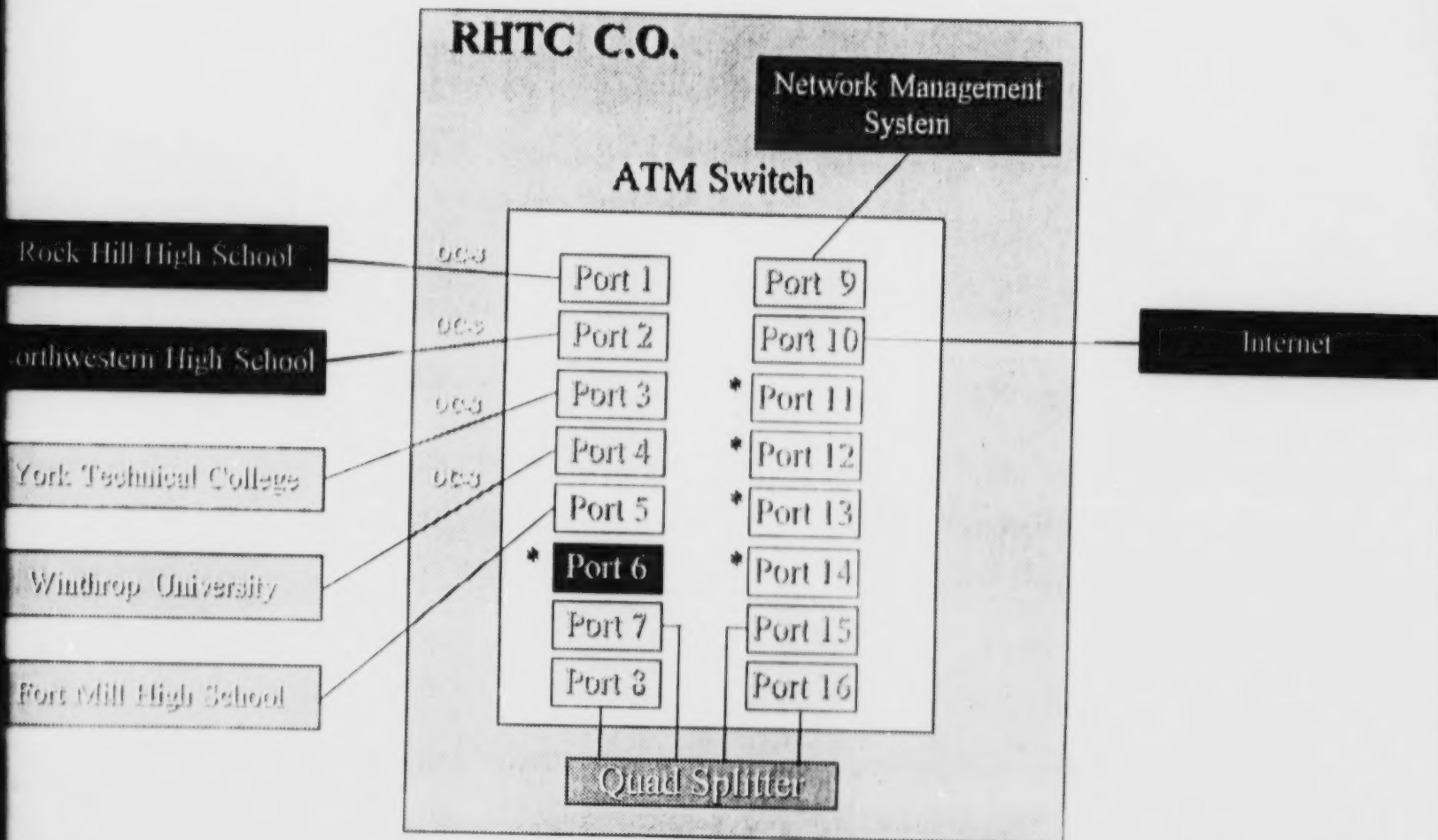
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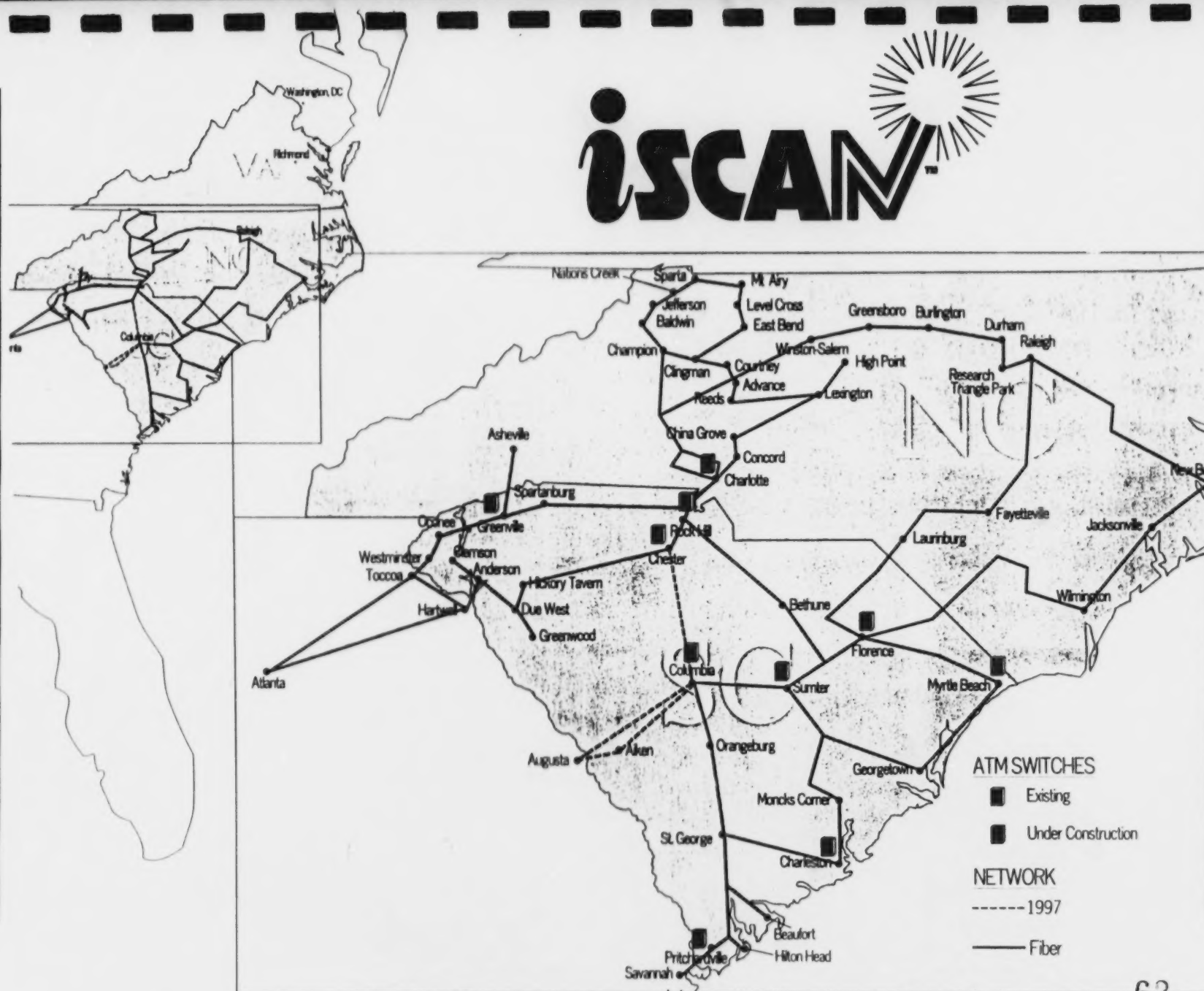
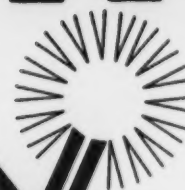
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Multimedia: Bringing the Sciences to Life - Experiences with Multimedia in the Life Sciences

Jane F. Cavender
Assistant Professor of Biology
(717) 361-1448
cavender@acad.ETOWN.EDU
and
Steve M. Rutter
Director, Instructional Services Department
(717) 361-1189
ruttersm@acad.ETOWN.EDU
Elizabethtown College
Elizabethtown, Pennsylvania 17022

Introduction

'Straight' lecturing as the only method for information delivery was at one time an efficient means of college teaching. Increased enrollment in the biological sciences, the diversity of preparedness of the students, and the variety of learning preferences of the students require new ways of disseminating information and assessing classroom learning. With the availability of technology and the awareness of learning styles and preferences teachers can, and need to, respond to the various learning modes in creative ways. Multimedia has provided me with an excellent tool to integrate various teaching methodologies, address differences in learning preferences, and deliver factual and conceptual information with speed and proficiency.

In the life sciences the increasing availability of multimedia material is a double-edged sword. Exceptionally well-produced videos and animations can overwhelmingly enhance a lecture; however, evaluating the vast amount of information that is now available is labor intensive. Despite the wide assortment of materials, many titles are inappropriate for college level courses. Nonetheless, incorporating concise illustrations or animations can aid in the conceptualization of a difficult theory and make the effort rewarding for both the teacher and the student.

At the introductory level where large class sizes are the norm, multimedia helps to address a number of problems: the class size, learning differences, 8:00 am class periods, sleep deprivation, disparity in student's scientific skill levels and the reported two to three minute attention span of today's college students. Thus, with this diversity comes the need to remediate those who have little or limited scientific background and at the same time challenge the advanced student. In the small upper level classes, multimedia, computer simulations and Internet assignments aid to develop a partnership between the student and the material, the student and their peers, and the student and the professor. Detailed here are some of the multimedia techniques that address the difficulties in teaching both the large introductory and the small advanced level classes in the life sciences.

Multimedia in the Large Classroom.

When I first began teaching large introductory General Biology class I mimicked many 'who came before me' and used the overhead projector and the transparencies that accompanied the text. However, the standard overhead projector is not designed for a large lecture room screen, and many students have trouble seeing the transparency's details from the back of the classroom. Needless to say, it is virtually impossible to engage the students in active participation when they are unable to clearly see the material presented. Knowing that I could do more to increase the students' learning potential and at the same time develop a more organized and manageable way to store and update my lectures, I sought the advice of the Instructional Resources department. The director, Mr. Steve Rutter, introduced me to the computer-based slide show of the Aldus Persuasion[®] presentation software and within a few days I was off and running. Converting lectures to a computer-based slide show format allowed for the full use of the screen in the large lecture room, and the written text and images were much sharper. For faculty who are having success with the straight lecture style, adapting to a computer slide show presentation by using either Power Point[®] or Aldus Persuasion[®] is extremely simple and relatively labor free. If the transparencies or lecture notes are written with a word processor program then they can be easily pasted into the presentation programs. The computer slide show can be used in conjunction with the overhead projector and accompanying transparencies. By all means, it is not necessary or time efficient to scan transparencies directly into the computer slide show. An alternative to transparencies, but a little more labor intensive is to use text figures supplied by the publisher on an accompanying CD-ROM. However, be sure that the figures on the CD-ROM can be selected and cut from the disk into *your* slide show program.

Incredible advances in the life sciences from year to year, leave many of us barely enough time to keep up with the literature, let alone time to 'design' multimedia presentations for the lecture. Elizabethtown College is fortunate enough to have administrative support coupled with a superb technological staff that has committed to the installation of Smart Classrooms. What is a smart classroom by Elizabethtown College standards? The Smart Classroom combines many forms of instructional media into one system that is remotely controlled via a single operations panel. The key component of the system is a high resolution data/video projection system. The instructor can operate the system with minimal preparation and equipment setup. An AMX customized, programmable microprocessor-based remote control panel can adjust the lights, operate the curtains and projection screen, and control the volume on the sound system, often with the touch of a single button. In addition, the various pieces of equipment such as the S-VHS VCR, Laser Video Disc Player, Telecine, Visualizer, and Video Projector can be controlled. All steps of the presentation are combined into one or two button selections. The installed computer system also has the ability to control the equipment through software as well as display text, graphics, animation, spreadsheets, etc. In addition to the prerecorded forms of media, it is important to note that the smart classroom also has the capability to interact with the outside world. The Video Projector can display forty cable TV channels, in-house college educational programming, and live satellite teleconferences from around the world. The telephone system provides access to guest speakers through interactive audio conferencing.

In the past we had to assemble a multimedia system by removing a computer from someone's desk, a VCR from a classroom, and a laser disc player from the library, and patch the devices into a low quality LCD overhead projection display. The systems were unwieldy and difficult to operate. One main advantage to the dedicated smart classrooms is the fact that system is fully operational,

contained in one lockable podium, and requires no setup. The instructor simply turns a key to power up the devices, boots the computer, and is ready to go. With installation of the campus computer network, and the ability to share files between computers, it is possible for the instructor to have complete access to their computer files, essentially bringing the office computer to the classroom.

With this type of system it is possible to use the laser video disk that accompanies my introductory text. The Laser Video Disc Player is a playback only non-linear video format. It can play continuous video programming, or access individual video clips, animations, or still pictures. Video frames that are used to accompany the lecture topic are either accessed through remote control address entries, or through computer control. However, when lecture preparation time is limited I can simply integrate figures or graphics into the lecture by using the visualizer. The visualizer is also commonly referred to as a document camera. A high resolution document camera can display images placed on the stand through color video output. Using downlights, three dimensional objects, papers, photographs, books, maps, etc. are projected over the high resolution data/video projector. Transparencies can be displayed by activating the baselight. Thus, there is no cumbersome transition between the computer slide show and an overhead projector. The high resolution data/video projector enables the integration of a variety of multimedia sources and is capable of displaying a large screen image from the input. A routing switcher, line doubler, and computer interface box are responsible for providing proper signal rates and formats to the R-G-B inputs on the projector. Control of the projector and switcher is maintained by the AMX system.

Multimedia and Active Learning:

Although the sciences rely heavily on information delivery my desire is always to incorporate active learning strategies into the lectures and to address the different learning preferences of my students. In a large lecture setting it is often difficult to assess if all class members are comprehending the biological concepts. I observed a quick, easy assessment at the National Conference on Collaborative Learning in June 1994. A Harvard Physics professor, uses a Think-Pair-Share technique for large class sizes to 'test' whether his students had grasped the concept that was just presented. Think-Pair-Share is designed to assess the student as follows: 1) each student individually reads the multiple choice question on the slide; 2) they choose the 'correct' answer individually, and then; 3) pair with the person next to them to quickly discuss the answer. The lecturer can then immediately poll the class by a show of hands to see who is 'on-track'. By using multimedia these Think-Pair-Share questions can be easily added after each conceptual segment of the lecture. This active learning strategy coupled with the multimedia presentation makes the information delivery more efficient, the class more attentive, and the conceptual learning more successful.

Multimedia Addresses Learning Preferences:

As educators we are facing a student body that may not learn in the same way that past generations of students did. Moreover, in the introductory science class we are challenged with the classroom mosaic of students whose science exposure ranges from abominable to phenomenal. Often students do not even know how to study, let alone know what their preferred mode of learning is. Multimedia is the only way I have found that enables me to educate and deal with this freshman melting pot. Within each session the slides can be designed to accommodate the textual learner (straight text on the Power Point slide), the visual learner (integration of animated sequences or the use of the visualizer for mini classroom experiments), and the auditory learner (Think-Pair-Share activities and

video). The laboratory experiments meet the needs of the kinesthetic and tactile learner.

Multimedia can actually help students determine their learning preference(s). Introductory science courses are many times referred to as the student 'weeder' courses. Frequently, the student who does not succeed at this level may not actually be less intelligent than his or her peers but rather the failure results from not being challenged in high school. These students were never 'forced' to develop efficient study strategies. For students to study efficiently they must recognize that they have a distinct learning preference. Many science students do not discover that they are inefficient at extracting and comprehending the conceptual material from the text until they have failed the first or second exam. At this point the student is directed to the campus Learning Center, if your college is fortunate enough to have one, to determine if his scientific career is salvageable. To try and combat this recurring nightmare, I instruct my students in the first weeks of class to be attentive to not only WHAT information is presented but HOW the information is presented. They must determine quickly if the concepts were more easily understood because of the ease of the material or manner in which they were presented.

In addition to aiding the students in determining their learning preference, the multimedia presentation can be used to help the students study and improve their note taking skills. Science textbooks do not always present the information in ways needed for all students to comprehend the conceptual connections. Some students learn efficiently from the 'outline' format of the scientific textbooks. However, other students need to rearrange the information to reveal how the concepts are connected. By varying the formats used in the multimedia presentation of the textual material, students can 'experience' multiple styles of note taking. Some students discover that they need to 're-write' the text in a clustering or mapping fashion to develop and understand the conceptual connections. These types of presentations are fairly easy to assemble and the pay-off is often 'saving' some students from that disastrous first term.

Multimedia in the Advanced Level Classes.

All of the teaching strategies using multimedia mentioned thus far also apply to the small classroom or the advanced level science classes. However at the upper level, multimedia presentations can be expanded upon by incorporating computer programs and the Internet. When choosing computer simulation programs or, designing Internet activities three points must be considered:

- A) the scientific merit of the program
- B) the ability of the program to transition smoothly into your lecture or be designed as an out-of-class activity and
- C) the scientific background of the student.

A) Choosing a worthwhile program is not difficult but it is time consuming. Conserve your efforts and search for programs and video clips that accompany concepts that you believe are difficult for the student to comprehend. In searching for these things you will encounter other material that you can save and use in your lectures.

B) Many computer programs (software) are now available but not all are appropriate as visuals for the lecture period. The segments may be too long or they may not be 'compatible' with the multimedia lecture presentation. Computer simulations such as HyperCell[®] are a remarkable benefit to many students. However, I use this program as an out-of-class activity because it monopolizes

the computer and you can not transition back and forth between Hypercell[®] and Power Point[®]. In purchasing a site license for this program I can design group or individual activities that require the students to utilize the information on the selected software. Of course, this involves more work for the instructor since you must assess that the students did use the program and accomplish what you wanted them to learn from the 'activity'. Because I seek to make these assignments enjoyable and informative, I often create scenarios where the students must use the program to solve some clinically relevant problem. For instance, I have given assignments where individuals or groups must use the software to determine why a patient is dying from specific drug interaction. Or, to make it more exciting and competitive, scenarios can become more complex. For example, groups must race to save the world from an invading alien species that has poisoned the water supply with a toxin that blocks the adenylate cyclase pathway. Groups must submit their antidote and its mechanism of action for credit and assessment. In designing conceptual scenarios for the computer programs (versus a list of figures and animations for the students to simply view) students must use the program to: 1) understand the biological mechanism; 2) determine what is wrong in the scenario and; 3) fix the problem. If you have a very large class you can have the student groups exchange papers for a triage grading. In this way students inspect other possible answers and are forced to scrutinize a different mechanism for potential flaws in logic. This type of computer supplement to the classroom lecture allows for more material coverage and actually permits more time to delve deeper into concepts than would be possible in the finite class period.

C) The most difficult part of choosing a visual aid or a computer software program as a supplement for the lecture is assessing the actual benefit to the students. As in the activity outlined above, assessment is done after-the-fact to determine if the student learned what the activity was designed to accomplish. However, for the student who is struggling with basic mechanisms, or if his/her conceptualization of science is weak, the visual aid can cause more confusion than clarification. The frustration often results because a specific student has been a memorizer of information and an effective regurgitator of facts, but now he or she is having trouble creating conceptual connections. However, although the student becomes frustrated it is possible for the instructor to identify this individual and address their study skills.

A second success that I have had with computer usage in the upper level classes is the integration of the Internet to promote independence in student learning. This past semester yielded one of the highest student learning achievements I have had to date. In conjunction with a Speaker Committee at the college I brought Richard Preston, author of The Hot Zone, to campus. This non-fiction book details the history of the Ebola virus and the hair-raising efforts of the US Army and Center for Disease Control (CDC) officials to contain a possible Ebola outbreak in the United States. The book was assigned as reading material for the class, and students were instructed to use the Internet to obtain general information about single stranded RNA viruses and specific information regarding Ebola. Much to my delight, students began a crusade for information, downloading volumes of material that were posted on a common bulletin board. The students were as excited to obtain the information as they were to learn about the scientific subject. To aid in assessing if the students were learning the specifics of single stranded RNA viruses, and viruses in general, I dedicated one laboratory period to show a video on the latest Ebola epidemic followed by a discussion of the movie and the Internet information. The 'discussion' was designed to test not what information they had gathered but how much they understood the reports. This entire exercise was extremely successful on both a personal note and as witnessed by the class exam scores. [My wish would have been to make the bulletin board an electronic one, but this I will save for next year.]

How to get started.

If you would like to use multimedia in your classroom it is important to start slowly - very slowly. Begin by simply transferring your lecture material into a slide show presentation. You can then add visuals in the form of transparencies projected through the visualizer/laser disk or cut into the presentation from a CD-ROM. If you have the time, you can begin to scan the Internet for added information. Internet information can be found in the form of electron micrographs (www.blocklabs.wisc.edu/Welcome.html) or live motion video of cellular events (www.cellsalive.com). I have found that for a video sequence to be effective it needs to illustrate the concept you dictate in a short time frame (2-5 minutes). Many commercially available videos move too slowly to be effective and can actually detract from the lecture. Thus, I have had more success with video sequences downloaded from the Internet.

As we approach the 21st century it is more imperative than ever that all students, not only science majors, grasp the basic concepts and technical advances in the life sciences. In this next century it will be necessary that we as teachers take advantage of the technological and human resources available on our campuses, be cognizant of varying learning preferences, and adapt the technology to these preferences. Multimedia presentation has allowed me to reach out to all students in ways I would never have accomplished without it. Technology and multimedia will never replace teachers. However, with the changing learning and lifestyles of today's students, teachers who use technology and multimedia may replace teachers who don't.

Ethical Issues Involving the Internet

Mary V. Connolly
Mathematics/Computer Science Department
Saint Mary's College
Notre Dame, Indiana
connolly@saintmarys.edu

The Internet is a network of networks, sharing the same protocol and linking universities, research communities, businesses and individuals world wide. It encompasses virtually all means of communication except direct touch; it is not the post office or the television or the telephone, but somehow all of these and more. All students, technical or not, are and will be net citizens. Are they prepared to be good net citizens? Do our facilities, policies, courses and vehicles for learning outside the classroom foster good citizenship? Do we give the non technical students a way of evaluating this resource? Do we enable them to learn how to use the Internet in appropriate ways or do we assume that they will just pick it up on the fly? This paper will make the case that there are serious issues involving privacy, intellectual property rights, electronic speech and access which can not be left to chance. In this new global information infrastructure, all citizens need to understand the power and pitfalls of the technology in order to function as responsible members.

The Internet allows an unprecedented invasion of personal privacy, i.e. control over how much and what kind of information about oneself is given to others.[1, 97] Certainly new technology in the past has also threatened personal privacy, but never with the same power. Now, personal information can be broadcast widely at great speed. It is true that television can reach at least as many people, but television provides only one way communication. Telephones provide speed, but the communication is one-to-one. The Internet can also provide anonymity, making it difficult to develop a trusting relation with the entity with which information is shared. Since our traditional notions of privacy are based on the physical world, the cyberspace environment in which information can be reproduced and transmitted without the knowledge of the holder of the information is particularly troubling. [2,60]

Let us view the problem through the eyes of a commercial concern using the Internet for business and then through the eyes of an individual who visits the commercial concern's site on the Internet. A commercial concern typically targets its advertising to those it feels are potential customers; the cost of the advertising must be offset by the increase in sales resulting from the advertising. Current technology allows an organization to gather all kinds of information about its online customers, so inexpensively that cost is hardly a factor. Some of this information consists of expressed preferences or actual requests for information; an individual is obviously aware that he or she is providing this information. But a great deal can be learned from recording the behavior of the individual as he or she visits the site; the individual may have no idea that pages visited or time spent on a particular page is being recorded, yet, over time, this kind of information could build a fairly accurate picture of a customer. With this profile, the commercial concern could then engage in push marketing, sending customized advertising to its potential customers, customized even to the point of organizing the site to match the interests of the customer. It should be pointed out that

many customers might appreciate the fact that information is tailored to their interests, as opposed to just receiving generic advertising. The commercial concern could, of course, sell its customer profiles to other companies, a practice which certainly predates the Internet. The problem is that the generic sending of advertising to a list of lists (or spamming), which is easy to do, not only results in invasions of privacy but in fact threatens the Internet itself. Jill Lesser, Deputy Director, Law and Public Policy, America Online, speaking at the Computers, Freedom and Privacy '97 conference in March, 1997, estimated that 50% of the weekly traffic on America Online was of this nature before screening to prevent spamming was put in place.[3] Needless to say, AOL customers were not happy.

Now what about the concerns of the individual accessing the site? Consider the ways in which people do business off the Internet. Many still prefer the anonymity allowed by paying in cash, thereby not releasing any information about themselves to the commercial concern. Even if they are willing to supply some information in order to complete a transaction, they certainly do not expect to be followed while browsing in a store, particularly not by someone who records their every move. But this is exactly what might happen to Internet shoppers. Hence the Internet presents us with a big dilemma: a wonderful way to customize the satisfaction of a customer's needs and a powerful way to violate a customer's privacy. Of central concern is whether to offer an individual an opt in plan, where permission must be sought before any information gathering takes place, or an opt out plan, in which an individual must take the initiative to stop the information gathering or passing.[4]

Are people genuinely concerned about this privacy invasion? The Graphics, Visualization and Usability Center in the College of Computing at Georgia Institute of Technology completed its fifth WWW user survey in April, 1996. This is the largest web based survey both in terms of the number of responses collected and the number of questions asked. The scale used was 1 (strongly disagree) to 5 (strongly agree). Most respondents strongly agreed (4.6/5.0) that they valued being able to visit sites on the Internet anonymously. Respondents also agreed (4.4/5.0) that users ought to have complete control over which sites get demographic data. Respondents, however, indicated a willingness (78.5%) to supply demographic data if they were told ahead of time how that information would be used. They did not feel that content providers have the right to resell information about its users to other companies. Most (4.0/5.0) did recognize a role for advertising supported content. [5]

In an earlier survey conducted by Louis Harris and Associates for Privacy and American Business in 1994, entitled *Interactive Service, Consumers and Privacy*, 76% of respondents felt that businesses ask consumers for too much personal information. Fifty two percent expressed interest in participating in subscriber profiling and receiving advertising and information about products matching their interests, but 60% said it would be very important to be fully informed about the collection of profile information and how it would be used before deciding to subscribe (a definite opt in desire). Forty nine percent considered it very important to be able to review the information in their subscriber profile and correct any errors. The accuracy problem addressed by this last question is indeed a serious issue. How can an individual know if the information kept about himself/herself is accurate if he/she does not even know if the information is being collected or where it is? Even if initial information is accurate, how will it be kept up to date? In this same survey, 73% said they would rather see companies and industry associations voluntarily provide

privacy policies as opposed to having these policies imposed by government regulation. [6.39-40]

Is it possible or likely that companies or industry associations could produce privacy policies which would provide adequate protection for individuals and would be fully implemented? What is adequate protection? After all, the opt in strategy is just fine for individuals, but opt out is much easier for commercial concerns. Certainly individuals should expect to be informed about the privacy and security consequences of an online transaction before entering into one, and they should expect appropriate security to be used. Different privacy standards might be needed in different contexts. The eTRUST project is a promising way to promote privacy policies. This program, started originally by the executive director of the Electronic Frontier Foundation and the founder of Portland Software, a provider of secure technology for Internet transactions, is scheduled to be launched in 1997. Those sites following key principles designed to protect the privacy rights of consumers could display an eTRUST "seal of approval" on their site.[7,38] It is unlikely that all privacy protection will come from the private sector, in part because there are international considerations due to the global nature of the Internet. Many countries have already enacted privacy law or developed enforceable privacy standards. If the United States does not develop appropriate safeguards, businesses in the United States may be disadvantaged and individuals may find that they receive less protection in the United States than elsewhere.[8]

Although the discussion here has focussed on an individual doing business with a commercial concern in cyberspace, personal privacy is a big issue even if an individual never opted to conduct business on line. For example, balancing the desire to keep computerized medical records private against the desire to make them accessible to those who legitimately need access is a major dilemma. [9, A19]

Fortunately there are several organizations working on privacy issues. The Electronic Privacy Information Center (EPIC) was formed in 1994 to focus attention on privacy issues. Privacy International is an international human rights group founded in 1990. Computer Professionals for Social Responsibility (CPSR) is an organization of people concerned about the impact of technology on society. The Electronic Frontier Foundation, begun in 1990, works actively on privacy issues. [10]

What advice can we give to the student enjoying the Internet? The best privacy protection certainly comes from not giving out information in the first place. Encourage students not to fill their home pages with information that is best not broadcast to the world. When dealing with a commercial site, understand the privacy policy before providing information. Understand the difficulties if a site operates with opt out policies rather than opt in policies. Question why the information requested is needed and what benefit you will receive for providing the information. Weigh the request against the benefit. Many people blindly fill in online information requests without thinking. Remember that personal information is valuable; if it were not, why would someone else want it?

The Internet is an incredible source of information of all kinds; it enables a free flow of information to all citizens of cyberspace in ways never before possible. However, owners of information (authors, artists, designers, etc.) have a right to be compensated for their work; indeed without any system to protect owners' rights, it would be hard to encourage such people to produce

their work. Copyright law has supplied this system in the past, but the new medium of the Internet raises interesting questions. How can we balance the rights of multimedia developers to use older works against the rights of copyright owners to be paid when their works are used? Are online services responsible when copyright infringement takes place? What is an infringing copy? Is this copy framework even a reasonable way to handle intellectual property rights in an electronic medium?[11,167] Although copyright issues may often be central in a discussion of intellectual property rights, in the development of web sites patent and trademark issues as well as licenses can also be important concerns. Any individual can be both a developer, with the need to pay attention to copyrights on material to be used, and an user, who may wish to download copyrighted material.

First, a bit of background is helpful. Copyright laws refer to original works that have been fixed in a tangible medium of expression. The laws are based on the power given to Congress in the United States Constitution to promote arts and science by granting exclusive rights for a limited time to authors for their writings.[12,751] Different rights apply to different categories of work, i.e. the way a literary work is treated differs from the way a sound recording is treated. The copyright protection is held by the person who can claim to be the origin of the expressed work. When another individual takes an original work and creatively selects or arranges it in a new way, interpretation of the law becomes more complicated. Under the law, authors have the right to reproduce the work in copies, prepare derivative works, and distribute copies. Since the reason behind copyright laws is supposed to be the promotion of arts and science, there are fair use restrictions which allow educational institutions and researchers to make limited copies of works which otherwise are covered by copyright law. But what are copies when the work is accessed on the Internet? Is the temporary copy made in RAM when a site is down loaded considered "fixed in some medium"? Are digital transmissions copies? Usually the first sale of a copy removes the right of the owner of the work to control further distribution of that copy. If I buy a book I am free to give it to a friend, but then, of course, I do not have the book myself. In digital works, if I make a copy to send to a friend, I still have the original copy. Hence it could be argued that unless you delete the first copy, first sale rights do not apply. The situation becomes even more interesting when copyright laws of other nations are factored in; after all the Internet is global in nature,. Currently European law grants rights to authors for a longer period of time than was the case in the past. Hence works which were in the public domain are now back under copyright protection. Despite the questions, copyright law is being applied to the Internet. Developers must take copyright law into consideration.[13]

The debate will surely go on, even as the current law is being applied. Several groups have strong interest in the copyright debate: the information industry, worried about copyright piracy in the digital environment; academia, anxious to preserve fair use; libraries, very dependent on the first sale part of copyright law; service providers, who do not want to be liable for subscribers' transgressions. There are two coalitions particularly active in the debate. The Creative Incentive Coalition represents publishers and others who distribute copyrighted works. The Digital Future Coalition is a group of many organizations, including the American Library Association, the National Education Association, the Electronic Frontier Foundation and the Electronic Privacy Information Center. [14,1] Where does this leave the average student or net citizen? Currently, such a person must be aware of the copyright law and must act accordingly when, for example, developing a web site. Although most people are accustomed to thinking about this issue when they are tempted to use another's text, the same issues apply when using another's graphics. Even if fair use is claimed for a noncommercial site, the developer must still evaluate how much is borrowed.

how accessible the site will be, and the potential harm to the market value of the borrowed work. As we turn our students loose to develop home pages, we had better make them aware that it is usually not legal just to grab someone else's graphics. Rather, emphasize original works and permission for those works which are not original.

Today, students seem to visit computers to check their e-mail almost more frequently than they check their post office boxes. Students and non students alike have found that e-mail, chat rooms and newsgroups enable them to say and hear whatever they want. Any individual can easily establish a presence on the web and publish a statement which is transmitted globally. No more passing out pamphlets to get one's views to the public. But when the electronic speech becomes extremely offensive to some, we can expect to hear about it. Remember that issues of free speech are never debated over motherhood and apple pie. As Mike Godwin of the Electronic Frontier Foundation said at the 1997 Conference on Computers Freedom and Privacy, "Speech matters. That is why it is worth protecting." Questions about free speech can not be answered without considering the first amendment to the U. S. Constitution. "Congress shall make no law ... abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble..."[15,758] Recall that the fourteenth amendment essentially does not allow a state to abridge these freedoms. But not all speech is protected; perjury, for example, is not protected by the first amendment. Neither is speech which is directed to inciting imminent lawless action and likely to produce such action, as was established in *Brandenburg v. Ohio* (1969).[16, 7] Problems come when the first amendment must be interpreted in the light of new media, such as electronic speech. One must be careful not to assume that free speech is adequately protected because it is protected in standard media; this kind of thinking can lead to free speech restrictions any time a new media appears. An important part of the first amendment is the right to peaceably assemble; surely the Internet gives us a new way in which to do this.[17] So when is it that this is going to be a problem for individuals using the Internet? Surely, regulators and legislators will want to jump in when constituents become vocal about really offensive speech posted in newsgroups or elsewhere on the net.

A case in point is the Communications Decency Act. Congress became concerned with the direct negative effects on children of sexually explicit materials available on the Internet. This material is put on the Internet both by commercial pornographers and individuals. Members of Congress were also concerned that parents would be deterred from the educational benefits of the Internet by the presence of such material. Hence the Communications Decency Act was passed in February, 1996. Basically the act has three provisions. The first is the transmission provision which makes it a criminal offense to knowingly create and initiate the transmission of indecent material, knowing that the recipient is under 18 years of age. The second provision is the specific child provision which makes it a criminal offense to use an interactive computer service to send to anyone under 18 any communication that describes sexual or excretory activities in terms which are patently offensive to contemporary community standards. The third provision is the display provision which makes it a criminal offense to use an interactive computer service to display patently offensive sexual material in a manner available to anyone under 18 years of age. The Act establishes a defense if the provider restricts access by requiring use of something which verifies the age of the recipient, for example, a credit card or adult personal identification number. The day the Act was signed into law, it was challenged by the ACLU in the U.S. District Court for the Eastern District of Pennsylvania on constitutional grounds. A temporary restraining order was issued. Other organizations filed their own constitutional challenges, and the suits were consolidated. All three judges hearing the case

agreed that the statute violated the first amendment. Two judges also concluded that critical provisions were unconstitutionally vague. All three agreed that the Act should be preliminarily enjoined. The government appealed to the Supreme Court, which heard arguments on March 19, 1997. The attorney general had previously announced an interpretation which would have it apply only to commercial pornographers.

The arguments in favor of the CDA can be summarized as follows. The CDA is a zoning ordinance for the Internet, similar to standard speech related municipal zoning ordinances which, for example, keep adult movie theaters away from residential areas or restrict broadcasting of indecent material during certain times of the day when young people are likely to be listening, ruled justifiable by the Court in the *Federal Communications Commission v. Pacifica Foundation* case in 1978. The *Pacifica* case was not an outright ban, but rather zoning in support of the well being of children. Also, the filtering (to verify the age of the recipient) required by the CDA puts less burden on adults than other types of zoning. Without the protections of the CDA, many parents will not be willing to allow use of the Internet in their homes, thus depriving children of the benefits of the Internet and weakening the Internet overall due to the smaller number of participants. Services do exist which can handle the adult verification requirement. Also, the CDA utilizes the least restrictive means to accomplish keeping indecent material from minors, means far less burdensome and more effective than those found acceptable in other zoning cases. Screening software which parents could use is not capable of identifying and screening all indecent material.[18]

The arguments against the CDA can be summarized as follows. Indecent speech (as opposed to obscenity or child pornography) is protected speech under the first amendment and can therefore be restricted only in a narrowly defined context when there is a compelling state interest. The Internet is a medium which involves so many forms of human communication that a narrowly defined context, such as those used in broadcasting or dial-a-porn, is not possible to achieve. Judge Sloviter, writing in the District Court decision, concluded that Internet communication was unique, but more akin to telephone communication than to broadcasting. The community standards test is not applicable when using the Internet, which has no boundaries. It would be impossible for someone to know whether or not he or she was breaking the law due to the large number of very different communities linked by the Internet. A prudent person would avoid the Internet altogether, thus having a chilling effect on free speech. The state does have a compelling interest in protecting children, but there are already narrowly defined statutes which do this. The CDA is so broadly drafted that legitimate material such as art work or information on AIDS is likely to be restricted. As Justice Breyer pointed out during the Supreme Court arguments, two high school students could violate the CDA by discussing their sexual exploits on line. There are better ways for parents to control the sites their children access; for example, the PICS (Platform for Internet Content Selection) program would allow parents to decide what is best for their children. The validity of the CDA can not stand on the decision of one attorney general about how it will be enforced; if it did, the validity of the law could change with a change in the attorney general.[19] When giving the keynote speech at *Computers Freedom and Privacy '97* on March 12, 1997, Ira Magaziner, Senior Advisor to the President for Policy Development, gave his personal opinion that if a bill similar to the CDA were passed, it should be vetoed.

The Supreme Court is expected to issue its decision on the CDA early in the summer of 1997. No matter what decision is reached, the issue of appropriate speech on the Internet will be debated

for some time to come. What advice or guidelines can we give to students so that they will be good citizens in this area? Perhaps the same kind of advice we might give for any kind of discourse is appropriate; respect the views of others, even when you do not agree. Preserve your right to disagree by doing so in well crafted arguments. The practice of "flaming" does not usually win supporters to your cause, but logical discussion based on fact is likely to sway opinion. Use the Internet in ways which will allow everyone to participate; be sure to be a listener as well as a speaker. In fact the Internet is a powerful medium which enables some people to find a voice they never had before. Severely handicapped people who may not be able to speak are now able to participate. Good net citizens will participate in ways which encourage the global exchange of information and opinions while respecting the rights of all citizens.

The global nature of the Internet becomes ever more valuable as more and more people have access to the Internet. Access is an issue within the United States as well as being a global issue. Consider for a moment the current users of the Internet; commercial enterprises, colleges and universities, libraries, government agencies, individuals. All the users listed have the hardware and software necessary as well as enough technical expertise to use it. It is clear that there are many within the United States who do not fall into this category and will be seriously disadvantaged as use of the Internet expands, particularly into commercial areas. Part of a solution could be found by looking at how access to information has been achieved in the past. The great strength of the public library system has been its mission to deliver information in useable form to any and all citizens. Several features of a public library combine to make it effective; it is free, it is a public, physical space, it enables individuals to find needed information, and extensive information is available. The Internet could do much of this, but some of the copyright questions raised above will have to be resolved. Certainly we need public store houses of knowledge now more than ever, and we need to make that knowledge accessible to all.[20,62] Since public libraries already have the physical space, it seems that a reasonable starting point is to put free Internet access into those libraries. In fact, libraries which have already done so have found enthusiastic response from the public. The public library in South Bend, Indiana, was one of the first public libraries to offer free Internet access; over the last couple of years it has greatly expanded the number of stations available. In addition, the library offers a variety of training sessions. San Francisco's public library had no trouble raising funds for its new high tech library. The demand has greatly exceeded expectations; designed to hold 5000 people, the daily average is about 6000 people.[21,20-21] Libraries, however, will not solve all the access problems. The Internet community will need to find a variety of ways in which to provide access to those who can not easily access this medium.

The Internet, however, is a global network; hence questions of access beyond the United States need to be addressed. Certainly incompatibilities in technical standards among nations need to be resolved, but that is probably the easiest part of the problem. Different political, social and economic traditions lead to different information policies; not all governments want to encourage the free flow of information. Simply enabling the free flow of information does not cause the free flow of information.[22,66-67] There are no easy answers here, but good net citizens will have to have a global view of their world. As our students move to the world beyond graduation, we hope that they will be concerned about providing others the kind of access to the Internet that they enjoy.

Having established that privacy in this electronic world, copyright law as applied to digital information, electronic speech and access to the Internet all are areas in which there are many

questions yet to be answered, how do we prepare that good net citizen? First by making sure that students think a bit about these issues at the same time they are learning to use the technology. Knowledge and responsibility come coupled together. We need to be sure that all students, no matter what their majors, have an awareness of the power of the technology they use and an understanding of how to use it appropriately. All students are more than eager to get their e-mail addresses as soon as they arrive on campus; that eagerness provides a golden opportunity for some quick education on appropriate uses and guidelines. Further discussion of the issues raised in this paper might take place during an orientation to information technology or as part of a project in a general studies curriculum. The College of General Studies at Boston University used the theme "The Information Revolution" for its Capstone 1997 project. In the introduction provided to the students, all major issues were addressed, allowing students to be exposed to the important problems and to pick one for an in depth project.[23] However, it is equally important that we not make the mistake of assuming that the technical student will somehow just know how to be a good net citizen. Indeed, such students are often more able to abuse technology because of their technical knowledge. These issues must be raised in the appropriate places in the technical curriculum. However the Internet may change in the future, the need for good citizenship on the part of all users will remain.

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Migration to Windows NT

Daniel T. Doles
Network Manager
Franklin College of Indiana
501 East Monroe Street
Franklin, Indiana 46131
voice: (317) 738-8151
doles@franklincoll.edu

Introduction

In the eyes of many IT professionals "migration" is a four-letter word. The re-configuring and re-training that goes with a migration can be quite overwhelming. However, in the constantly changing world of technology, migration is not only inevitable but many times necessary for survival, especially when the end result is simplicity for both users and IT support staff alike. Such was the case at Franklin College.

Our migration to Windows NT took place during the spring and summer of 1996 and was performed in two phases, beginning with the administrative users followed by the faculty users and student labs. The paper will address the reasons for selecting Windows NT and the steps taken to complete the migration. The available tool set that simplified the migration as well as the many ways Windows NT has streamlined network management will be discussed. Finally, some of the mistakes that were made and a few of the drawbacks that were encountered will be shared as well.

Pre-Migration Environment

In order to put some of the decisions that were made into perspective, a brief overview of our environment prior to the migration would be beneficial. The primary network operating system at the time was Pathworks, which is Digital's implementation of Microsoft Lan Manager. Two separate Pathworks servers were being maintained; one for the administrative users and one for the academic users (faculty and students). Both servers were running the VMS operating system with TGV Multinet providing our TCP/IP transport. Hence, these machines provided POP3 mail service for their respective constituencies in addition to file and print services.

In addition to Pathworks, Novell Netware was being supported on a pentium-based server. This was dictated by our administrative database application, *Campus* from Applied Business Technologies, Inc., which at the time required Netware. The sole function of the Netware machine was to serve this database application.

In terms of the clients on the network, a wide spectrum of "computing horsepower" existed on campus. Our inventory of desktop and laptop computers ranged from 90MHz pentiums with 16MB of RAM and 1GB hard drives to 8MHz 286 computers with 1MB of RAM and a 20MB hard

drive. With this range in hardware capacity came a variance in software capabilities. Three versions of Windows and multiple versions of DOS were being supported. The existence of machines incapable of running any version of Windows necessitated supporting multiple versions of several production applications including word processing, spreadsheets and e-mail. Adding further variety were the handful of Macintosh machines of different types.

All in all, no fewer than five user databases were being maintained, including two in VMS, two in Pathworks and one in Netware. In addition to the two network operating systems, at least three disk operating systems (DOS, VMS and System7) were being supported. The number of nodes on the network had surpassed 300 and was growing rapidly. With roughly one and a half staff members dedicated to network administration and the variety of platforms being supported, it was clear that network management needed to be streamlined.

Why Windows NT?

The first order of business was to select a single network operating system. At first glance, it would seem that Netware and not Windows NT would be the logical choice, not to mention the path of least resistance. With a Netware server already in place, migration from a mixed environment to strictly Netware would have been simple. However, several factors were examined and considered before our direction was chosen.

First and foremost were the requirements of the ABT *Campus* software. Previous versions of *Campus* took advantage of the strong file sharing capabilities of Netware, making it a necessity. However, a newly released SQL version of *Campus* made the client / server strengths of Windows NT an attractive and viable option.

The next factor considered was the network transport. With the rapid growth in Internet use on campus, TCP/IP had quickly become and will continue to be our standard protocol. The support of TCP/IP by Novell was in its infancy. Windows NT has offered TCP/IP as a transport since its inception.

It should also be pointed out that our academic server was an Alpha 2000 machine capable of running Windows NT. While pure Netware for the Alpha was in the offing, no release date was available. Clearly, preserving our investment in server hardware had some influence on our decision.

Finally, there were some concerns about Novell and its corporate direction. They had just purchased WordPerfect and Quattro Pro and were pouring a lot of effort into development of their new office suite. The fear was that they had lost focus on their true strength, the Netware network operating system. While Novell has since abandoned these efforts, it was cause for concern during our decision making process.

Phase I: Administration

The first step taken was the purchase of a second Alpha. This machine would become the new administrative file server. It would also be our first Windows NT server and hence our Primary Domain Controller. The purchase of this Alpha allowed us to define a one-time migration path for most of our files and applications. It also gave us the luxury of being able to test the built-in migration tools and experiment with some of the management tools available. Furthermore, the addition of this server would ultimately make it possible for us to dedicate the existing Alpha as an SQL database server.

Once the first Windows NT machine was up and running, we immediately installed and configured the Gateway Service for Netware. In a nutshell, the Gateway Service for Netware allows a Microsoft network client to access resources on a Netware network without any Netware client software installed. The Gateway Service for Netware includes the Netware Migration Tool which performs numerous migration functions such as:

- account and group transfers from Netware to Windows NT,
- file and directory transfers from Netware to Windows NT, and
- preservation of effective rights (permissions) on transferred files and directories.

The Migration Tool also allows a trial migration to be performed in order to determine exactly what will be transferred and what will not. However, the one thing the Migration Tool does not do is magically turn a Netware server into a Windows NT server.

After using the Migration Tool to transfer all of our Netware accounts and groups to Windows NT, we configured a Windows NT client and used it to simultaneously connect to a Pathworks share and an NT share. In the Pathworks environment, most of our PC applications were installed in a single share. The contents of this share were copied to a corresponding NT share and then tested. Fortunately, all of these applications tested successfully and none had to be installed from scratch on the NT server. A similar procedure was used to copy and test the *Campus* software with similar results.

It was decided that Windows for Workgroups (3.11) would be the minimum version of Windows supported. Hence, many of the administrative PCs would need to be upgraded. In addition, the nature of the *Campus* software prevents a one group at a time migration. As a result, we were forced to create dual configurations on approximately 60 administrative PCs running version 3.1 of Windows. This process included renaming the current Windows and network configuration, installing and testing a new Windows for Workgroups configuration, renaming the newly installed configuration and then restoring the previous configuration.

Once all the clients had been prepared, we were ready to implement Windows NT for the administrative users. We began by recopying the *Campus* data files. The Netware server was then shut down, the Netware software removed and Windows NT installed. Lastly, we went back to each client PC to invoke the Windows for Workgroups configuration and remove the old Windows and Pathworks configuration.

This phase of the migration began in late February and was completed in early April of the 1996 spring semester. The second phase, which included the faculty and all the student labs, would be conducted during the summer months, beginning in early June. Consequently, the two months in between were used to address the issues that arose following the administrative implementation and to plan the steps to be carried out in Phase II.

Phase II: Faculty & Student Labs

Several factors influenced the planning and implementation of Phase II. First of all, only a portion of the faculty are present during the summer months. Thus, higher priority was given to those on campus. Also, one of our student labs was scheduled for use during summer school and special accommodations would have to be provided for that lab and the students using it. Moreover, the acquisition of more than 75 new PCs resulted in a massive installation and redistribution effort that had to be coordinated with the migration.

Only a handful of the faculty had access to the Netware server and the *Campus* software. Therefore, most of the faculty accounts and groups were not created by the Migration Tool in Phase I and had to be created manually. On the other hand, this also meant that faculty PCs did not have to be dual configured as the administrative PCs were. They were merely prioritized then migrated one after another. The migration process simply entailed upgrading the Windows software and configuring the network software for Windows NT. In fact, many faculty members received computer upgrades as a result of the redistribution project. Their upgrade computer would be configured before being delivered and their old computer either taken away for further redistribution or simply taken away.

In terms of the student labs, the migration to Windows NT brought about the need to reevaluate some of our configuration standards. Prior to the migration our lab machines were all configured with a utility called *Iron Clad*, which essentially write-protected the hard drive and theoretically provided virus protection. In reality, this program made the slightest configuration change quite time consuming and proved not to be completely virus proof. Consequently, we removed *Iron Clad* and replaced it with *Norton Anti-Virus*. The hard drives are no longer write-protected but the critical configuration and initialization files are stored on a write-protected network share and restored each time a PC re-boots.

The redistribution project afforded us the opportunity to add a few specialized servers to our environment. The first of these servers was dedicated to electronic mail. The POP3 server software selected was *IMail Server for NT* from Ipswitch. This product uses its own user database, but we were able to export the Windows NT user database and import it to *IMail* fairly easily. The second specialized server was designated our World Wide Web server and uses the Microsoft *Internet Server* software.

The final step of Phase II was to reformat the academic Pathworks server and configure it with Windows NT and Microsoft SQL Server. The old administrative server continues to function as our primary Domain Name Service server on the Internet. It is also our Kerberos server for college personnel with dial-in access.

Tools of the Trade

There is a plethora of tools, services and utilities that greatly simplify migration to and management of Windows NT. The Gateway Service for Netware, while not intended to provide a permanent solution, makes the transition from Netware to NT extremely easy. Other built-in services such as Dynamic Host Configuration Protocol (DHCP), which dynamically allocates IP addresses, and Windows Internet Name Service (WINS), which provides a dynamic database of NETBIOS name to IP address mappings, offer tremendous management time savings. Services for Macintosh makes sharing files between PCs and Macs easy.

Another feature to take full advantage of is the login scripts. Each time a user logs on to the network, their record in the user database is checked and any specified login script is executed. The login script can be used to connect shares, map a home directory, copy configuration files (as is done in our student labs) and perform many other tasks.

One of the "extras" that comes highly recommended is the Resource Kit for Windows NT. This kit provides supplemental documentation and includes a CD with numerous useful utilities. Some examples include an account creation utility, a Windows-based command scheduler, a batch file user input utility and an Internet name service lookup utility.

Drawbacks and Mistakes

There were not many, but we did encounter some drawbacks. Of primary concern to us was the lack of any supported Domain Name Service software. However, DNS server software is provided and supported in version 4.0 of Windows NT. The lack of a supported POP3 mail server that uses the NT user database for authentication has added some extra overhead to our environment as well. Some of the other applications and utilities that we continue to run in the VMS environment because an NT equivalent does not exist are Kerberos, which is used to validate dial-in users, CSO, which is an e-mail address lookup utility, and the VMS command line multi-key sort utility.

In retrospect, we found a number of things we could have planned or done better and more efficiently. We could have tested Windows for Workgroups more thoroughly and possibly anticipated some of the performance problems that emerged. A lot of post migration adjustments could have been eliminated had DHCP and WINS been implemented initially. Such was the case with a number of features that we discovered during the course of the migration.

Conclusion

In short our migration accomplished the desired goals. We have standardized on a single network operating system. Administration of the network is quite manageable and streamlined. The number of user databases has been reduced from five to two. In the near future we hope to migrate to a new mail system that will reduce this to a single user database. Client configuration is extremely simple and we have narrowed the scope of applications being supported. All in all, the trials and tribulations endured throughout the migration have been repaid tenfold in peace of mind.

Are Computer Science Students Ready for the Real World

Noreen Elliot
Senior Training Analyst
Equifax Marketing Services
P.O. Box 740006
Atlanta, GA 30374-0006
(770) 740-4708

Abstract:

The typical undergraduate program in computer science includes an introduction to hardware and operating systems, file processing and database organization, data communication and networking, and, of course, programming. But what does such a program teach the student about working in industry? This, paper, written from the point of view of a training analyst for a major corporation who has had over ten years of experience teaching and developing courses and curriculum for a small college, suggests that many computer science graduates lack the ability to integrate the concepts "learned" into a skill set and a pattern of approaching problems that would enable them to fit easily into a business organization and to succeed in such an environment. The paper outlines types of skills necessary in business/industry and makes suggestions for integrating the development of these skills into the computer science curriculum. Over fifty graduates from undergraduate programs throughout the southeast were interviewed by the author. Approximately half of the graduates were already working in computer related positions; the others were in the process of interviewing for such positions.

The average graduate of a four-year program in computer science has spent approximately half of his time in computer related classes, learning about hardware, operating systems, networks, analysis and design of systems, and, of course, programming. Most graduates have a base of theoretical knowledge upon which practical skills can be built. They can write programs in two or three different languages, they know the difference between a CPU and disk drive; they can tell you the steps in analyzing and designing a system; and they can discuss the advantages and disadvantages of object oriented programming. But have they learned the skills that will help them to land a job and to survive in the workplace? What activities/requirements could be added to the courses already in place that would enhance their ability to succeed? The following is a discussion of the nontechnical, nontheoretical skills necessary to survive and advance in the work place. This discussion is not meant to be all inclusive, but merely a starting place for incorporating such skills into computer courses.

General skills required in the workplace:

1. **SKILL:** *Ability to manage his time and setting priorities.* In most cases, the graduate has learned how to manage his time, developing schedules for himself that include time for working, studying, and relaxing. He has learned to juggle several tasks at one time, such as studying for

a calculus exam, writing an English paper, completing a computer program, and finishing a project at work all in the same time period.

ACTIVITIES: Assign varying numbers of projects. Some of the projects should have the same due date, some different due dates. The projects should have varying levels of difficulty throughout the course - assigning increasingly difficult projects as the courses progresses gives a false impression of projects tackled in nonacademic situations. Within reason, "last minute" projects should occasionally be assigned.

2. SKILL: *Work effectively as part of a team*, understanding that the goals of the team often supercede the goals of the individual and that teams necessarily have both "stars" and "workers", are important concepts in the workplace. When working in a team, if one member does not pull his weight, the other team members must pick up the slack. However fair or unfair it may seem, a team oriented organization holds the entire team responsible for both success and failure. As far as management is usually concerned, late projects are the fault of the team. Cooperation - seeing the situation from other points of view, sharing resources, getting along with non computer people, and adapting to different management styles - is the basis of working effectively as part of a team.

ACTIVITIES: As often as possible assign students to groups, making sure that each student has the chance to be a leader and a chance to be a "follower". Groups should vary in size, allowing the individual groups to work out sub groups, if necessary, as well as individual roles. Evaluation procedures should be developed to evaluate the group as a whole and the individuals within the group. Discussion of the group experience is a necessary follow-up activity. If individuals in a group are working well together adding a "ringer" who will not do his assigned tasks or who disrupts the groups is a valuable short term method for helping the groups learn to solve problems among its members.

3. SKILL: *Generalize learning to various situations*. A successful employee knows how to learn new concepts and how to apply old concepts to new situations.. He does not expect an instructor to explain everything to him. He has learned to dig through user manuals, help screens, and libraries.

ACTIVITIES: After ensuring that the necessary resources are available, have the student modify a program written in a language he has not used yet. After a student has learn to use a specific operating system well, assign him projects to complete on other operating systems so that he will have to learn how systems are similar and different.

4. SKILL: *Managing stress*. The individual needs to be able to manage stress and stressful situations in such a way that the situation does not affect his health or his ability to complete the task at hand. The stress may be due to continually changing deadlines and specifications for jobs or due to interactions with a difficult co-worker, boss, or customers. The individual must learn to be flexible in his expectations, adjusting to changes in plans, deadlines.

ACTIVITIES: Discussions and role playing are effective methods for helping students deal with stress. The discussions should include how to separate work and personal time, how to deal with

last-minute demands, how to deal with difficult people in order to create a win-win situation, how to take mini-breaks, and when to walk away from a situation.

5. **SKILL:** *Communicate effectively.* The individual should be able to use verbal and written communication well. He should be able to present his ideas in a clear coherent manner. The individual should be able to interact and communicate successfully with various types of people, asking questions, seeking information.

ACTIVITIES: Include frequent mini papers to allow the students to practice written communication in their field (papers in freshman English classes are not the same concept). Hold both impromptu and planned discussions and debates in classes covering topics of interest to the field. Have student do frequent informal and formal presentations in front of small and large groups. The more practice students have with communication skills, the more comfortable the students will be with communicating effectively.

6. **SKILL:** *Supporting ideas and problem solutions.* Not only must students be able to form solutions to problems, but they also must be able to explain why their solution is reasonable. They must be able to understand their ideas clearly enough to be able to defend them to themselves and to others.

ACTIVITIES: From the first course, students should be asked to present their solutions to small and large groups, justifying their approach to the problem and suggesting alternative methods of solution. Debates, both formal and informal, on relevant issues in computer science are effective tools for crystallizing ideas and concepts.

"Computer" skills required in the workplace:

1. **SKILL:** *Logical thinking* as illustrated through the development of algorithms. Algorithms are evident in the solutions of all problems, whether writing computer programs, designing a system of some sort, or planning a route to a new destination.

ACTIVITIES: Before taking any programming course, students should be introduced to the design solutions to problems using words, diagrams, and a combination of both. A traditional example is to have a team of students explain how to tie a shoe, giving the procedure to a second team to actually follow. Additional problems, such as designing a queuing system at the local fast food place, or setting up the schedule for a softball league, bring practical situations into very discreet steps. This introduces the concepts of logical design, walkthrus, and modification before any programming language is used.

2. **SKILL:** *Eliminating program errors.* In the workplace, bugs are errors and they are not acceptable - a program must work for all data, all the time. Programming errors can increase the cost of producing a product by causing program re-runs, product recalls, and lost business.

ACTIVITIES: From the very first course, only complete, correct, and error-free programs and assignments should be accepted from students. Using the term "error" instead of "bug" to refer to mistakes in software emphasizes the fact software problems are unacceptable. Thus, from

the very first project, students should perform walkthrus on their code and on the code of other students. When testing a program, students should develop test data to cover all possible situations. Documentation of the systematic testing of the programs should be kept. Incomplete programs and incompletely tested programs should not be accepted - there is no partial credit in the real world!

3. SKILL: *Reusing software* is not only a timesaver but it is also critical to the high productivity levels expected from programmers - as far back as subroutine and functions in FORTRAN, code has efficiently been reused in order to save testing and coding time. Starting each program from scratch may be personally satisfying for a student, but it is not how the world operates. Reduction of errors, testing time, and programming time are key elements in increasing programmer productivity.

ACTIVITIES: Introduce student early to the concept of building their own libraries by using modules they have coded and thoroughly tested as the basis of their library. Using modules from classmates (after proper permission is obtained and proper credit to the original author is included in the module) and from other sources, saves time when the modules have been well-documented and thoroughly tested.

4. SKILL: *Adjusting to constantly changing project specifications*. Students are used to getting a programming assignment, coding it, and turning it in with no changes in assignment specifications. But customers do change their minds, frequently. Students need to be able to make modifications in their code easily and efficiently - a well documented and modularized program makes this possible.

ACTIVITIES Hand out a programming assignment with a specified due date. On the date due, have the students make "last minute" changes to the program before turning it in. Allowing time in class helps students adjust to the stress of such a change without rewarding those who wait for the last minute to code their projects. Gradually increase the difficulty of the projects and the complexity of the modifications.

5. SKILL: *Developing good design skills*. The cost of trial and error programming is not readily evident to most students. They rarely have to pay for CPU time and they rarely see a clock ticking off CPU time, especially in the PC oriented labs at most schools. As long as an assignment is completed they usually can not tell exactly how long the assignment took to code and test.

ACTIVITIES: Limiting students to a set amount of computer time or lab time on a particular project helps make them aware of the type of planning that should take place before sitting down to code at a machine. Using a manageable project, have students fill out a "timesheet" that includes spaces for designing the program, writing the algorithm, writing the code, coding the project, correcting syntax errors, correcting logic errors. Done over a series of projects, such a timesheet should assist students in observing the negative correlation between the time spent designing and writing the algorithm and the time spent debugging logic errors.

In conclusion, although students need to learn a specific body of knowledge to be considered computer scientists, simply teaching them theories and information will not allow them to succeed in the field. They must learn how to effectively apply the knowledge in the real world. They must also be able to communicate ideas effectively, work with a variety of people, and expand their knowledge and skills as the field changes.

Video Networks in an Electronic Classroom Environment and Analysis of Student Preferences in the Development of a Network-Based Video Distribution System

Anatoliy Gordonov
gordonov@postbox.csi.cuny.edu
Michael Kress
kress@postbox.csi.cuny.edu
Marianne Carlin
carlin@postbox.csi.cuny.edu
Computer Science Department
The College of Staten Island/City University of New York
2800 Victory Boulevard
Staten Island, New York 10314
phone: (718) 982-2850
fax: (718) 982-2856

Introduction

The Electronic Learning Environments currently available can considerably improve teaching effectiveness. Networked multimedia computers enhance instruction by facilitating the distribution of text, graphics, sound and video images, providing communication links, and allowing continuous monitoring of student work.

The distribution of video images is important in computer science courses. The ability to present visualizations of programming concepts and actual procedures on each computer screen is an effective pedagogical tool. Computer procedures and program outputs are for the most part visual phenomena. Students learn much more rapidly when they do not have to continually translate a verbal description into a picture of what appears on the computer screen.

Networked computer laboratories are usually configured as a digital network of an instructor's workstation and students' personal computers. A large monitor attached to the teacher's workstation or an LCD panel on a overhead projector serves for demonstration purposes. In these laboratories, the instructor usually presents material at the front of the room and then rotates among the students answering individual questions. This setup is not particularly conducive to maintaining students' attention nor does it lend itself easily to collaborative activities.

Superimposing an analog video network such as COMWEB¹, Tech Commander² or V-Net³ over the digital network improves upon the above configuration in several ways. Real-time, full motion video information is distributed to each individual computer screen. The source of the video information can be the teacher's computer, a student's computer or an auxiliary device. In addition, the teacher can monitor classwork by successively scanning each student's screen. See Figure 1.

The faculty at the College of Staten Island currently use the COMWEB system. In a continuing evaluation of this electronic learning environment, the faculty have noted the following advantages. One of the most difficult aspects of teaching in a networked computer laboratory is holding students' attention while delivering instructions. When the professor has control of all the mice and keyboards the students cannot wander to other activities while the professor is introducing the exercise. The distribution of the image to individual screens improves each student's visibility over the more traditional large monitor or overhead projector.

PHYSICAL STRUCTURE OF THE HYBRID ANALOG/DIGITAL VIDEO NETWORK

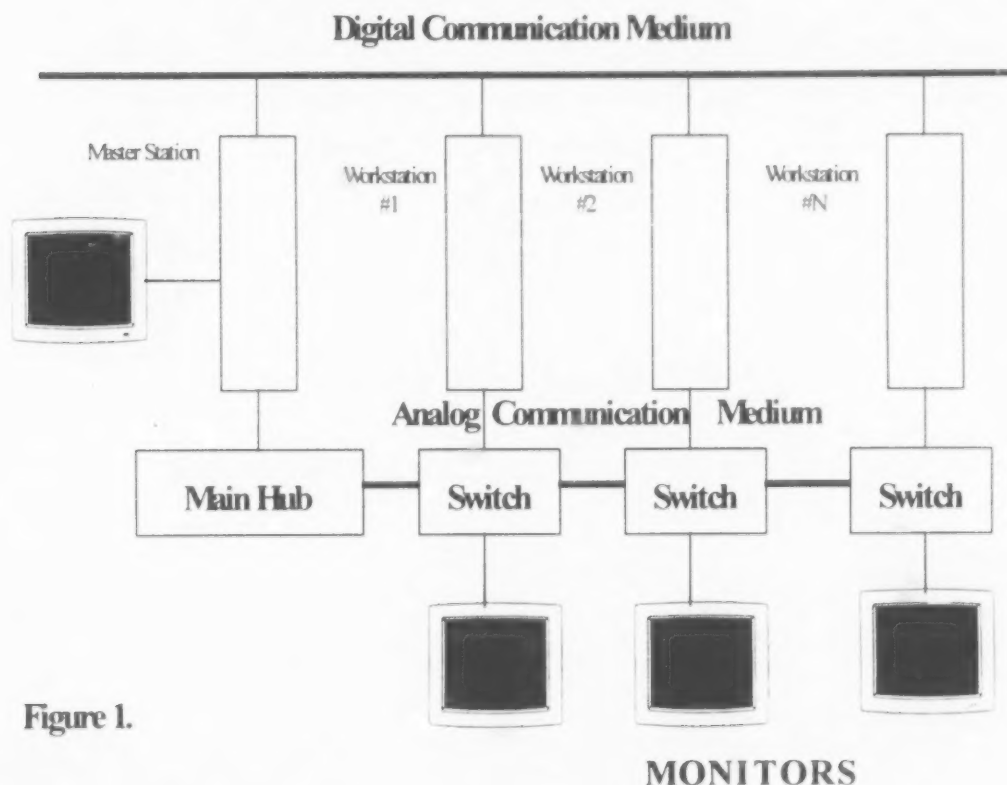


Figure 1.

The faculty also reach beyond the presentation capabilities of the system and use it to enhance students' performance while they are working independently on laboratory exercises. The COMWEB system displays each student's screen on the teachers' station for a specified period of time so that the professor can easily check who is working on the assigned task. This continual monitoring of class performance facilitates just-in-time feedback to the class. Students who are procrastinating can be brought back on track before significant time is lost. Professors can coach

students who are following fruitless paths of investigation or are stuck at a dead end before they fall too far behind.

The professor can also spend more time watching the work of a small sample of students without drawing their attention away from their work. This quiet review facilitates the professor's understanding of the thought processes or the direction which an individual or group of students is taking. By sharing the screens of a selected group of students, a professor can encourage collaborative activities to solve more challenging problems.

Evaluation of Student Performance and Student Response to the COMWEB System

Faculty members who teach with the COMWEB system have conducted evaluations of the system in order to explore its advantages and to suggest possible areas for further improvement. One of the first evaluations of the COMWEB examined student performance in a computer literacy course, "Computing for Today". This course consists of three parts which include word processing, "Word Perfect", database, "dBASE IV", and spreadsheet, "Quattro Pro". Each part can be considered as a separate five-week course which incorporates a set of special assignments and an examination. Two sections were studied, one using the COMWEB system in addition to the college's digital network and one using only the digital network.

Although the sample size is small and only describes two sections, the numbers in the chart show substantial improvement in student performance in both the database and spreadsheet subsections of the course. These numbers suggest that the students in the sections using COMWEB grasped both the procedures and the concepts much better than the control group. The decrease in the average deviation is intriguing. Faculty using the COMWEB system perceive that more students in the class are engaged in the lesson and receiving feedback from the professor than in an ordinary networked computer laboratory. If this decrease in the average deviation is found consistently in further studies, it would support the faculty's proposition. See Table 1.

In a second evaluation of the COMWEB system, two classes were surveyed, a computer science major course and a computer literacy course. In both classes, two professors used COMWEB system extensively. The Computer Science course, CSC 430 covers software engineering using Visual Basic; CSC 122 teaches computer literacy in Windows 3.1.

The students in both classes appreciated the video distribution of images to their own screens. The majority of students in both classes indicated they preferred a video distribution of the teacher's screen to individual computer displays rather than to a large screen display. The students also indicated that the COMWEB was an effective teaching tool, agreeing that they understood the material better when the professor was using COMWEB. See Table 2.

While again the sample size is too small to claim to be representative of all the students taking computer science courses, the overwhelming positive response from the students has indicated to the faculty that continued development of a system similar to COMWEB is a worthwhile endeavor.

Comparison of the academic achievements.

Table 1

Subcourse	Section taught without Video Network		Section taught with Video Network	
	Average Grade	Average Deviation	Average Grade	Average Deviation
Word Processor	84.5	9.7	86.9	9.2
Database	71.3	13.9	92.3	6.8
Spreadsheet	73	13.5	93.8	7.1

Student Assessment of Impact on Learning

Table 2

Questions (Sample size N = 31)	Strong/ Moderate Agree	Strong/ Moderate Disagree	No opinion
The screen images distributed over the COMWEB system are clear and focused. I can see the presentation on the screen on my table more clearly than on a screen in front of the room.	26 84%	2 6%	3 10%
I prefer taking a class in which the professor is using the COMWEB system to one in which the professor uses a computer connected to a large screen.	24 77%	2 6%	5 16%
I pay more attention and understand the lecture/demonstration better when the professor is using the COMWEB system.	23 74%	6 19%	2 6%
I understand material better when I am able to see work done by other students in the class.	17 55%	6 19%	8 26%

Technical Considerations

Users of educational technology must be aware of the technical as well as pedagogical advantages or disadvantages of a system. The distribution of video information in a classroom poses difficulties⁴. Any video, especially motion video, requires the transmission of a huge amount of data. This volume of data necessitates paying for large disk space and high data transmission speed. Although current methods of data compression partially solve this problem, it still is troubling.

Transmission of video information interferes with the local area network outside of the classroom. Transmitting video information through the digital medium inside the classroom creates additional traffic outside the classroom in the part of the LAN limited by bridges. This slows down all network activities on the LAN considerably, affecting other classroom, research laboratories, and faculty and administrative offices. One faculty experiment showed that using a telecommunications product CU-SeeMe on 2 to 3 stations increased traffic in the network by up to 40%.

Motion video information is by nature, delay-sensitive because each frame must be delivered on time. The slow down in the local area network completely disrupts the distribution of motion video.

The current system resolves these problems by creating a hybrid analog/digital network. The analog component is dedicated to the video distribution. The digital medium consists of the underlying digital network connecting the computers. The analog medium combines a VGA bus controlled from a master station with several additional control lines. The monitors which are connected to the bus can work in one of two states: 1) local - when the monitor is displaying the work the user is undertaking independently at his/her workstation; 2) remote - when the monitor is connected to a remote source of video information. The COMWEB system, the analog component used at the College of Staten Island, is a pure hardware system which provides physical connections among 36 workstations and a master workstation. A panel with buttons at the master station is used to control the video network manually. Figure 1 shows the physical structure of this network. Several modes of transmission are available on this network. See Table 3.

This architecture has significant technical drawbacks. The centralized control of the analog part of the network prohibits the interactivity of the network because only one station at a time can be active. When the monitor is in the remote mode, the workstation is, for all practical purposes, disabled despite the fact that the computer itself can concurrently execute some other task by communicating with other nodes through a digital medium. The COMWEB system lacks a flexible and friendly interface. These deficiencies hinder the wider use of video webs.

Generalized Modes of the COMWEB System.

Table 3

Logical Operation	Physical Mode	Description
Broadcast	Mode 1	Transmit from instructor's station to all student stations.
	Mode 3	Transmit from student's station to all other students.
Multicast	Mode 2	Transmit from instructor's station to one or more student stations.
	Mode 4	Transmit from student's station to one or more other students.
Monitoring	Mode 5	Transmit from all student stations back to instructor (scanning).
	Mode 6	Transmit from one or more student stations back to instructor.

Future Development

Professor Gordonov is developing a two-layer management protocol which substantially improves the existing combination of analog and digital network⁵. The combination of the analog network, the digital network and the management protocol constitutes a hybrid analog/digital video network (ADViNet). This ADViNet seeks to extend the pedagogical advantages and overcome many of the technical difficulties of the COMWEB system now in use.

The pedagogical considerations concern the use of the network for coaching and monitoring individual students and for encouraging collaborative activities among groups of students. The survey administered to the majors course and the computer literacy course suggested that the two groups wanted different teaching styles. The non-majors were much more interested and positive to the idea of individual coaching, while half of the majors expressed no opinion to that question. In contrast, the non-majors were evenly split about developing the network to accommodate small groups of students who want to work together, while the students majoring in computer science were overwhelmingly positive to that idea. See Table 4.

Although this small sample may not be representative of all majors and non-majors, the results suggest that design issues in the future development of the network should take into account the needs of the different populations of students which it will serve.

Different Preferences of Majors and Nonmajors

Table 4

Questions	Strong/Moderate Agree		Strong/Moderate Disagree		No opinion	
	Non-major	Major	Non-major	Major	Non-major	Major
I receive more individual coaching or feedback when the professor is using the COMWEB system	9	6	3	2	3	7
In the future, I would like to be able to work cooperatively with a small group of students, sharing screen images without going through the professor's station.	7	13	6	1	3	1

The multi-level protocol is designed to decentralize the control in the video network. On the physical level, the network will retain all the display features currently available in the video web. The main function of this level is to support manual and programming control of the analog video network. The proposed protocol superimposes a logical level on top of the physical level. This level decentralizes the control of the video network so that any station with appropriate authorization can initiate video distribution or monitoring.

The logical level provides the opportunity for a real-time adaptive response to student performance in the laboratory. Data from each workstation can be fed into a common database. This information can be continually analyzed to decide which stations should be monitored. For example, the professor could choose to watch only those students who are not completing exercises according to a predefined schedule.

The resulting ADViNet system covers all major instructional activities. These include lecture, individual and group tutoring, demonstration/modeling, seminars, test and drills. See Table 5.

Main Instructional Activities in the ADViNet Environment.

Table 5

Instructional Activities	ADViNet Operations	ADViNet Layer Employed
Lecture	Broadcasting	Physical
Individual Tutoring	Multicasting	Physical
Group Tutoring		
Modeling (Teaching by Example)		
Seminars	Broadcasting/ Multicasting	Logical
Tests/Drills	Monitoring	Logical with adaptive network reconfiguration

Summary

Faculty experience shows that Hybrid Analog Digital Networks prove to be useful in the classroom environment. Not only do they support major instructional activities, but they are also very efficient in the distribution of full-screen motion video and other graphical images. The ADViNet does not introduce extra traffic in the local area network and does not slow down other network operations. The multi layer ADViNet protocol will be used for the future development of software aimed at specific network-based instructional functions (real-time coaching, computer assisted intelligent monitoring, group work, and others).

The use of a video network is an efficient and effective teaching tool in those courses where the course content is completely new to the students, requiring extensive use of lecture and presentations from visual sources. In advanced classes, laboratories and seminars, video networks have proven productive for modeling, individual and group tutoring, and monitoring.

Student surveys suggest that the students like to take classes in a classroom equipped with a video network. They prefer video networks to other systems of video distribution (such as big screens) and consider it an effective teaching tool.

Although the faculty is committed to future development of the Hybrid Analog\Digital Network, some intrinsic features of video networks limit their flexibility as compared to digital networks. Understanding this fact defines the direction of the future of the ADViNet development which is to incorporate ADViNet into the global contemporary digital video environments (such as "LearnLink"⁶). This incorporation allows faculty to exploit the benefits of the hybrid video network component in places and situations where it has a clear comparative advantage over regular digital networks, while not sacrificing the availability of additional features from the sophisticated digital networks.

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The Role of Facilities and Faculty Peer-to-Peer Mentoring in Supporting Faculty's Use of Multimedia/Computer Technologies in Support of Classroom Instruction

Arthur W. Haffner

Professor and Chief Librarian

(718) 982-4001

<http://www.library.csi.cuny.edu>

haffner@postbox.csi.cuny.edu

Michael E. Kress, Ph. D.

Professor and Chairperson, Computer Sciences Department

Special Assistant to the President for Information Technology

(718) 982-2527

<http://163.238.182.53/>

kress@postbox.csi.cuny.edu

College of Staten Island

2800 Victory Boulevard

Staten Island, NY 10314

Abstract:

The authors outline characteristics of the College of Staten Island/CUNY digital information infrastructure. They amplify the college's vision for supporting faculty use of technology. They illustrate the successful use of faculty peer-to-peer mentoring for expanding the pedagogic use of word processing, e-mail, listserves, homepages, the Internet for curriculum enrichment and research, and electronic materials (text, audio, images) in presentation programs. The authors describe the recently completed Faculty Center for Excellence in Pedagogy and Media Technologies, a facility that provides faculty with access to two media specialist personnel and computer hardware and software. The authors also describe two teaching laboratories, one for group instruction consisting of a network of 21 PCs and another that is a 35-station teleconferencing laboratory for bridging learning distances.

I. College Overview

The College of Staten Island (CSI) is one of the eleven senior colleges (Baruch, Brooklyn, City College, Hunter, John Jay, Lehman, Medgar Evers, NYC Technical, Queens College, Staten Island, York) of the City University of New York (CUNY). Along with CUNY's Graduate Center, CUNY Law at Queens College, and CUNY's accelerated medical program and medical school, there are six community colleges (Borough of Manhattan, Bronx, Hostos, Kingsborough, LaGuardia, Queensborough). CUNY is the largest urban university in the United States and is the third-largest public university system. Over 204,000 students are enrolled for degrees on campuses in all five boroughs of New York City. Another 150,000 students take adult and continuing education courses.

CSI is a college committed to access and excellence. It is a major urban public institution that offers a liberal arts curriculum to a diverse student population of 12,200 (8,400 FTEs), all of whom live off-campus. It offers an associate degree in selected areas, a comprehensive range of baccalaureate programs, a master's program in selected areas, and doctoral programs in cooperation with the CUNY Graduate School.

II. CSI's Electronic Network Infrastructure

In 1993, CSI relocated its facilities from two separate sites to a new 204 acre campus. Prior to this move, early planning for the new campus information network identified several key objectives:

- (1) a network-centered electronic information environment where services are distributed to users much like electricity and water are provided as utilities, with the Office of Information Technology serving as the single point of contact for information services, network support, Help Desk contact, and selected training;
- (2) a learner-centered electronic environment for on-campus or remote (dial-in) access to college services that may eventually include processes such as admissions (information and application), financial information (aid, balances, payment options), academic advising, course registration and information, records management, among other services;
- (3) a mobile electronic environment for computer-assisted communication on-campus or off-campus from anywhere at any time.

Today, CSI's electronic infrastructure consists of two extensive disjoint fibre optic networks. The first data network consists of a high speed FDDI ring that connects eighteen campus buildings. Within each building, twisted pair ethernet connects each room. The linkage provides access to eighteen file servers and electronic mail, which are managed by the Office of Information Technology. This local area network (LAN) connects approximately 3,000 computers that are located in administrative, staff, and faculty offices and in fourteen computer-assisted laboratories throughout the campus, where each laboratory has an average of 36 work-stations.

CSI's LAN links to a wide area network, CUNYNet, by means of a 0.5 single T1 link which allows delivery of off-campus electronic mail and access to the Internet for World Wide Web use. The connection also provides linkages for scientific research among CSI facilities, supercomputer facilities at other universities, and to other CUNY university-wide computational facilities.

The second system is a media distribution single-mode fibre optic network for CSI's Integrated Media Information Distribution System (IMIDS), a \$900,000 project begun in 1995 that is nearing completion and that is now in beta testing. The IMIDS consists of a head-end unit located in Library Media Services. It provides twenty source delivery devices. Forty-seven spaces (classrooms, teaching and research facilities, and administrative conference areas) are equipped with two-way video capability for receiving and transmitting signal to and from the head-end. In all, 110 spaces are wired to send/receive two-way video.

III. CSI's Vision for Electronic Technology

The faculty and administration have identified three broad goals that focuses CSI's vision for electronic technology:

- (1) fostering and enhancing faculty commitment to effective teaching and learning;
- (2) advancing the effective use of technology in all aspects of the college's operations so as to strengthen support services, teaching, and research;
- (3) strengthening student interest in life-long learning, their purposeful participation in the issues that face our society, and their lively commitment to their own physical and spiritual well-being.

These goals provide shape to CSI's vision for using electronic technology in the classroom. Broadly stated, the vision is to provide a technologically advanced learning environment that facilitates the seamless transformation of information into knowledge. For students, this environment envisions helping them to acquire information that is directly related to their course work, facilitating opportunities to explore the world of knowledge, and helping students to acquire skills and capabilities that may be applicable in their post-graduate lives. For faculty, this environment envisions helping them to pursue, investigate, and create knowledge.

IV. Transformation Forces at Work for Electronic Technology

There are several forces at work within and outside of higher education to integrate information formats, delivery models, and electronic technology to enrich learning, teaching, and research. Three of these forces are the following:

1. New faculty are comfortable with computer-supported technology and eagerly embrace and willingly integrate it into their pedagogy and research. Senior faculty are encouraged and supported to integrate technology into their pedagogy through programs of release time, professional development, and faculty peer-to-peer mentoring.
2. Trustees and senior administrators have allocated increased funding for technology since it offers the institution a competitive advantage for the recruitment and retention of students, staff, and faculty.
3. Publishers are beginning to provide textbooks and other publications aimed at K-12 and higher education markets that integrate print with CD-ROMs, online databases, information networks, and telecommunications.

V. Facilities Supported by the Campus Infrastructure

CSI's electronic infrastructure supports the use of high technology hardware in several types of campus educational facilities:

- (1) Multimedia laboratories (Windows and Macintosh platforms) for teaching subjects such as

accounting and finance, communications, computer-assisted design, computer sciences, graphic arts, history, modern languages, and science. These laboratories are also utilized for remediation and tutoring in subjects such as biology, chemistry, and mathematics.

(2) An Education Department training computer-assisted laboratory for K-12 teacher training that consists of a LAN, computer-workstations, and K-12 educational software.

(3) COMWEB electronic laboratories equipped with an analogue digital hybrid network to permit a teacher to control any computer in the laboratory from a teacher-station and display any computer on any group of computers in the laboratory. These facilities are used for teaching the Internet, digital library training, multimedia authoring, and similar other subjects;

(4) A satellite system for K and CU band reception, a direct digital TV satellite reception system, and local television broadcast facilities by way of the Staten Island Cable Television.

(5) A television studio with digital video editing facilities.

(6) For students with disabilities, a multimedia Center for Deaf and Hard-of-Hearing, a Multimedia Assistive Technology Laboratory for Students with Disabilities (visual impairments), a Disabilities Services computer laboratory with assistive technology, and assistive technology computer systems in the Library and the Biological/Chemical Sciences and in other campus buildings.

In addition to the facilities mentioned, the college's electronic infrastructure has allowed librarians to strengthen the role of the Library in the academic life of the college by employing technology to accomplish the following:

(1) distribute a large variety of sophisticated digital informational resources (abstracts, indexes, reference works) from a CD-ROM tower and/or the Internet to PC computers within the Library that are linked to the network;

(2) distribute digital Library information resources (CD-ROM and/or Internet based) over the network to any point on campus that is connected to the network, including faculty offices and teaching and research laboratories; (3) allow (eventually) CSI students and faculty remote access to the Library's digital informational resources over telephone lines.

CSI's electronic network is a key factor in allowing library collections of traditional books and journals to be creatively integrated and managed into an expanding electronic environment with digital and media resources. It is a key factor in allowing librarians to structure the library to become an electronic gateway to information services by extending its collections beyond the institution's walls to include resources available through electronic networks, fee-for-service databases, network consortia participation, and traditional library cooperative networks of interlibrary loan.

VI. Pedagogy and Media Committee's Role in Faculty Development

CSI's Pedagogy and Media Committee is composed of faculty, staff, and students who work in many areas on campus to integrate digital technology applications into teaching and learning. Each

semester the committee sponsors a series of seminars and workshops for faculty and staff who are interested to learn about technology. Some of the topics have included the following:

1. multimedia tutorial programs;
2. computer-assisted educational programs;
3. student-centered learning through discovery using the Internet's World Wide Web;
4. use of digital presentations and media-based material in classrooms;
5. creation of digital and multimedia materials for use in education;
6. teaching students to create digital and multimedia materials;
7. evaluating digital technology for effectiveness in teaching and learning;
8. exploring issues such as intellectual property and copyright (fair use doctrine).

The Pedagogy and Media committee also sponsors a more formal program for faculty who express interest to integrate technology into their pedagogy. Each semester two faculty members who are proficient in the use of electronic technology for classroom instruction are selected to serve as peer mentors. Each is awarded reassigned time to work closely with three to five other faculty colleagues. The objective of the collaboration is to provide information on teaching issues and information technology in learning and teaching. Examples of issues and electronic technology are the following:

- (1) using electronic mail as a technology enhancer for professor and student communication (electronic office hours) along with word processing for effective communication;
- (2) incorporating listserves (electronic journals), newsgroups, FTP and Gopher access to digital databases for curriculum enhancement;
- (3) developing homepages for assignments and course syllabi (supported in part by a Microsoft Educational Grant);
- (4) identifying selected Internet sites for curriculum support, enrichment, and research;
- (5) incorporating electronic material (text, audio, images) into presentation program such as PowerPoint for instruction;
- (6) applying advanced web technologies (multimedia effects, 3-D animation, Virtual Reality Modeling Language, application programs, and simulation modeling) into pedagogy.

Faculty coaching, bolster by technical support and training from staff media specialists, occurs in The Faculty Center for Excellence in Pedagogy and Media Technologies, a facility that is housed in Library Media Services. This facility is a focal point for integrating electronic technology in the

classroom environment. It is staffed with two media specialists, and its equipment includes state-of-the-art hardware (multi-platform computers, scanners, CD-ROM readers and writers, digital cameras, motion video capture and compression facilities, and traditional audiovisual equipment). Its software includes a variety of packages and off-the-shelf CD-ROM educational programs, and CUSEEME technology for video conferencing including picture-in-picture visual cues for a sign language interpreter for hard-of-hearing students. Adjacent to the center is a 21-station COMWEB computer laboratory with a teacher-station that allows faculty to test their programs in a model setting.

The Pedagogy and Media Committee steering group also coordinates the college's Teleconferencing Center. This facility is currently under construction. Beta testing is projected for the 1997 Fall Semester and to be operational at the beginning of the 1998 Spring Semester. Located in the Library, this facility consists of 35-stations. The Teleconferencing Center is an initiative in collaboration with CUNY's Office of Academic Computing (called 57th Street), the New York City Board of Education, and other collaborators interested in distance education in an urban environment. The facility will permit local television broadcast facilities by way of the Staten Island Cable Television. In addition, it will incorporate the use of fax, telephone, advanced web technologies over the Internet, and it will utilize CSI's Intranet. To support this facility, an additional T1 link is planned to connect the head-end of the Integrated Multimedia Information Distribution System to CUNY's Distributed Information System (CDIS).

CDIS currently consists of two-way video connections among the following sites: CUNY Television (located at the Graduate Center), the City College campus, and a central video conferencing and media distribution facility located at the CUNY's Office of Academic Computing. The system, when complete, will provide two-way video connections and shared media distribution facilities among seven CUNY campuses, CUNY Television, and the Office of Academic Computing.

Plans for distance education are embryonic. Discussions are currently underway among CSI, K-12 schools on Staten Island, and other CUNY campuses.

VII. Summary

CSI's administration has been successful in providing the college and research community with an open, network-centered technology for accessing information. Substantial progress has been achieved in providing faculty and administrators with workstation computers for access to data stored on local files or that is accessible through the campus Intranet or Internet linkage. Comprehensive, technologically sophisticated teaching laboratories are in place and operational for students who generally do not otherwise have access to computer equipment. The Library continues to develop its collections to integrate print with digital resources.

General and more formal programs of faculty development are conducted under the auspices of the college's Pedagogy and Media Committee. These include workshops and seminars offered each semester to the college community, and a formal program of faculty peer-to-peer mentoring for faculty who express an interest to use computer-assisted technology in their pedagogy.

The Pedagogy and Media Committee oversees a Faculty Center for Excellence in Pedagogy and Media Technologies, a 21-station COMWEB computer laboratory, and a Teleconferencing Center.

IS Staff Migration to New Technology

David G. Holland
Executive Director, Information Systems
Mott Community College
1401 E. Court St.
Flint, MI 48503
(810) 762-0210
dholland@email.mcc.edu

Introduction

For years the Information Systems staff has done a good job of providing Data Processing services to the school. However, the technology, which is being used at the school, continues to grow older. Better technology is now available and it may be the time for you to move to a new technology.

You can buy new technology. But, how to do you upgrade your technology staff? Without a qualified Information Systems Staff new technology will fail.

At Mott Community College, we were faced with a similar problem. What about the existing staff? Did we need to replace the staff along with the technology? I believed we could transition the staff along with the Systems Transition based on the following assumptions:

- Current staff had key soft I.S. skills such as: analysis, problem solving, etc.
- Current staff had key technical skills and could be trained to use new products.
- Current staff understood the basic principles of Information Systems.
- Current staff knew the business processes from a data movement perspective.

Developing a Plan

As with many major transitions, the key to success is planning. The first step in planning is analysis. You must completely and thoroughly analyze your existing technology and the technology you are planning to implement. Additionally you must analyze each individual on the Information Systems Staff. What are their current skills? What are their weaknesses? The more you know initially the easier it will be to develop a successful plan.

This analysis will become key to the plan you will develop. The first step is to determine what the Information Staff of the future will be:

- Evaluate the new technology and your needs.
- Determine the organization chart for the new technology.
- For each position determine the generic skills needed.
- Develop a job description for each "new" position.
- For each position determine the specific technical skills needed.

The next step is to evaluate the existing staff and match each individual to the best potential position in the new organization. Begin an individualized Staff Development Plan for each staff member. Since many positions are similar, you may be able to reuse some parts of each plan for other people.

Determine your general timeline. When will the new computer systems be purchased and installed? How long will it take to move applications to the new systems? How will you handle the transition? Will you allow changes to existing (old) systems while you are in the process of migrating to new systems? What is your budget? You cannot expect a staff member to be making changes to an existing system, learning new technology and working on a new computer system all at the same time. As you continue in your planning effort it may be necessary to adjust the timeline.

Based on a fairly short timeline, we determined the need for a "Migration Team". We hired a group of consultants to help us with the transition for a period of one year. The Migration Team was given the following objectives:

- Help us implement the new systems.

- Help us determine the best set of procedures and policies for our new systems.

- Work with the existing staff to help them contribute to the decisions for our new systems and new processes.

- Train existing staff to be able to support the new systems after they leave.

I believe this Migration Team was critically important to the success of our transition. They became a true part of the Information Systems Team during this key timeframe. They were treated the same as the full-time staff. Initially we relied on this team for most of the work and decisions. However, we did NOT allow the consultants to work independently. We assigned full-time staff to all project teams. Our full-time staff took the lead role in the results of the decisions.

By making the full-time staff member responsible for the decision we established ownership with our staff. Although the consultants made many of the early decisions, it was clear to the staff they would need to support those decisions in the years ahead. Thus, the staff members took the time to question the consultants and find out the reasons behind the decisions. Additionally, many decisions involved knowledge of our internal processes. The consultants would need information from our staff on our college procedures, data flow and politics. Since our existing Information Systems staff had this knowledge they were able to contribute to the decisions in this way.

Here is Mott Community College's Transition Team:

UNIX Administrator

HP-UX System Administration, HP-UX System set-up, HP-UX Performance tuning, UNIX and TCP/IP trouble shooting

LAN/WAN Administrator

LAN/WAN System Design, LAN/WAN System Installation, LAN/WAN System Maintenance, LAN/WAN System Administration, TCP/IP Management

Application Analyst/Developer (2 positions)

Business Process Analysis, System Analysis, Application Consulting, Office Automation, Some Software Development

Data Conversion Analyst/Specialist

Data Analysis, Data Conversion Development, ASCII file conversions, Relational Database Conversions

Training/Documentation Specialist (2 positions)

Application Software Training, Basic System Support - Windows 95, Microsoft Products, Technical Documentation, Training Documentation

Help Desk Specialist

Basic Help Desk Support - Windows 95, Microsoft Products, Priority determination, dispatching

Our team was quite large due to the short timeframe for our implementation. Smaller teams will require more time for implementation. Larger teams help get the job done quicker but obviously cost more.

After the timeframe for your migration has been determined, determine the basic skills needed for each staff member. Some of the basic categories we used were: PC Skills, UNIX, Database, Database Management, Report Writer, LAN Administration, System Operation and Switches/Hubs/Routers. For each category write an overview of the expectations of someone with these skills.

For example: UNIX - Must be able to sign-on and use the UNIX system effectively. Must have a general knowledge of all UNIX commands. Must have a thorough understanding of files and directories. A working knowledge of file editors is required.

From this you will need to analyze the job this person will be doing and determine the actual tasks to be performed by this staff member within this grouping. This should be broken down into specific and measurable tasks. Be as specific as possible. This list should contain many objective tasks, which will need to be done and will be easily demonstrable by the staff member.

By breaking the category into tasks you will be accomplishing five key objectives:

- The measurement of success will be objective and easily done.
- The measurement of progress will be objective and easily done.
- Staff members will know up front exactly what will be expected of them.
- There will be no confusion between Management and Staff.
- The list can be used to develop a training program, which will accomplish the specific needs for the individual staff member.

For example:

Using UNIX you should be able to:

- Log in and out of the system.
- Change your UNIX password.
- Run programs.
- Traverse a UNIX directory structure to access files.
- Create, update, modify, remove files and file structures.
- Determine and update file and directory permissions.
- Edit files with a UNIX file editor.
- Find filenames on the system.
- Use grep and piping for selection and display of data.

Display data file contents.

Spool files.

Determine file types.

Use the UNIX commands chown, chgrp, chmod, cd, ls, pwd, who and ll.

Use UNIX man pages.

This list of task should be as specific as possible. If you will expect someone to be able to install a new PC in one hour it should say "install a new PC in one hour". Both management and staff should know exactly what is expected.

Determine a "phased" approach to the plan. Which categories need to be handled first? Which ones next? Etc. At Mott we broke each plan into 3 to 5 phases. For the applications staff we focused first on PC and UNIX skills. Next we looked at learning the new application packages. The third phase focused on database access(query and update). The fourth phase was ad-hoc reporting tools. If you do not "phase" the plan, it will get difficult to see the forest for the trees. It will be important for staff to focus on specific items. They will not be able to learn everything all at once.

Selling the Staff:

Armed with this information you are now ready to present your plan to the Information Systems staff. I would advise the following approach to your presentation:

Start by pointing out how existing (old) technology has helped the institution. Point out how processes are automated. Re-visit some of the great accomplishments of the past. After all, the existing technology is not bad; it has just become out-of-date. There is no reason for anyone to believe it is being replaced because it has failed. Chances are, it has been a major asset for the institution. Make sure you state this!

Describe the new technology you've chosen. Hopefully the Information Systems staff has been involved the selection. Point out its advantages. Show the direction of the Information Systems Market to embrace this technology. Talk about the advantages for the future of using newer technology. Paint the picture of the future in Information Systems. Be enthusiastic.

Next, talk about the technical skills the staff already has. Talk about how the generic skills such as analysis, problem solving, process flow and other skills are still necessary with new technology. Point out how their existing knowledge of the institution will help them to implement new systems, which are even better than the existing systems.

Explain the migration. How long will it take? What will the expectation be during this period? Where will they get help? If you are using a migration team of consultants (part-time or full-time), point out how the consultants will team with the staff to learn the make decisions about, implement and learn new systems.

Present the new organization chart (for full-time positions) along with positions and job descriptions (or summaries). Discuss the Migration team positions, which will be filled, and their job descriptions. Make it clear that you will work with people individually and create a plan together

to help them to transition to the Information Systems staff of the future. You may want to point out the benefits to them of increasing their job skills. We created new titles, job descriptions and salary ranges for all of the new positions at Mott Community College.

Present the idea of an individualized transition plan to help staff transition to new technology. Describe the key components of the transition plan:

- The new position will have clear objectives to be met.
- The plan will be task based and objective, not subjective.
- The objectives will be identified at the start of the transition.
- A plan will be put together with each individual.
- An individual training program will be put together.
- Staff will be given time to train and practice their new skills.
- The transition plan will be phased with regular reviews along the way.

Building the Training Plan

Meet with each individual to formulate their Transition Plan. Since the categories (skill sets) and objectives have been identified, the next step is to identify a detailed training plan. Work with the staff member to determine the best way to train them. Consider Computer Based Training, Classroom training, Manual reading, one-on-one training from consultants and on-the-job training.

Add the training commitment to the Transition Plan. This would include: which classes the college will send the staff member to, which CBT classes will be taken, which manuals will be purchased and what on-the-job training will be done. Make sure to set specific dates and times for training. Also be sure to specify necessary time-out for training, reading and practice. For example, in some plans we have designated a staff member would be allowed to take 1:00 p.m. to 5:00 p.m. every Wednesday in May to take a certain CBT class. Also designate time for practice. We have allowed staff to take from 2 - 4 hours per week to practice their new skills. It will be important to factor this time into work schedules so people are not overburdened. If you are truly committed to the transition you should be committed to allow appropriate time for the staff to learn new skills.

Present the categories and phases to the staff member and work on a timeline for each phase. The timeline should include training, practice and actual work. The institution should make a commitment to the staff member. The staff member should make a commitment to the institution. We calculated our investment in our staff. This included: the cost of training, training materials, time to take CBT's and time to practice. You will probably be surprised at the total cost. The staff member should recognize the investment the institution is making in them. We asked the staff to accept some of the cost and be willing to use some of their own time for training and practice.

An example of a training plan from Mott Community College:

LOTUS NOTES:

Lotus Notes Basic Training	January 6	
Practice Using email	January 6-15	on-the-job
Lotus Notes Developer I	January 18-21	
Develop test databases	January 22-Feb. 15	Every Wed. Afternoon

Lotus Notes Developer II
Practice Notes Development

February 18-19
February 20-Mar. 15 Every Wed. Afternoon

When management and the staff member is in agreement on the plan, sign it! Again this will stress the commitment to the transition.

Working the Transition

As time passes, it is necessary to review progress periodically. If your plan is clearly defined this will be easy to do. Are you still on target? Has the staff member been able to get the training promised? Has the staff member had the time to exercise their skills? Can the staff member do the objective tasks as defined in the plan? If the plan needs to be updated, do it. Don't be afraid to make appropriate changes. Of course this technology is not only new to the staff member, it is new to management too. If you discover something new, update the plans as quickly as possible.

Be honest and up-front with your staff. You owe them praise when they do well. You also owe it to them to let them know if they're falling behind. Double check to see if you are giving them enough time to adjust to the new systems. Remember that you can't expect them to do two full-time jobs at once. If you want them to learn something new you must remove some of their old responsibilities.

Don't forget to use the Migration Team to help with the transition. Make sure consultants aren't developing "on their own". Ask yourself, if the consultants were to leave tomorrow could the existing staff handle the job?

Do a formal review at the end of each phase. Reward staff for their progress! You'll be surprised at how well people can learn new technology when you give them the opportunity to shine!

Design and Implement Custom Electronic Performance Support Systems (EPSS) for Training in Project Based Classes

Brian R. Hoyt
Assistant Professor Business Management
Ohio University
1570 Granville Pike
Lancaster, Ohio 43130
phone: (614) 654-6711, extension 252
fax: (614) 687-9497
hoyt@ohiou.edu
Mark Stockman

Coordinator of Computer Services & Instructional Technology
Ohio University
1570 Granville Pike
Lancaster, Ohio 43130
phone: (614) 654-6711, extension 605
fax: (614) 687-9497
stockman@ohiou.edu
Jerry Thalman

Associate Professor Accounting
North Central College
Napperville, Illinois 60563
phone: (630) 637-5588
fax: (630) 637-5121
gethalma@noctl.edu

Introduction

Electronic Performance Support Systems (EPSS) has been dubbed "the learning tools of the 21st century" by training experts. What is it, can education really use it to train business students, and how do we effectively integrate these systems into team project based classes? These are key questions that need to be answered as we evaluate a new delivery of business training for university business students. EPSS uses computers to capture, store, and distribute knowledge in both an interactive and non linear delivery. Using technology sources such as the Internet, Microsoft's Net Meeting, Connectix's color camera, and business software we can provide multiple site delivery and bring business education training closer to the workplace. These tools will help students, as well as business participants, to reach their highest potential performance quicker and with a reduced amount of faculty or training department support. In project based classes there are exciting opportunities for advanced problem solving in actual business situations that can be facilitated by advanced technology application. Students who are faced with unique challenges often require specific learning interventions.

Briefly, the pilot for our EPSS project includes a Quality Projects class at Ohio University in Ohio and a Managerial Accounting class at North Central College in Illinois. The pilot uses offsite project management technology to link a problem solving class (Ohio University), an accounting class in Illinois (North Central College), and a sponsoring CPA accounting firm in Ohio. The Ohio team is facilitating a continuous improvement project with the accounting team in Illinois to improve an actual CPA firm's referral system.

Rationale

Projects as the hub

Performance in the environment of preparing and educating business leaders should be described in only one context...the exact duplication of skills, knowledge, and attitudes necessary to be effective in a workplace environment. Authentic performance is the milestone. Educators in the business field (management, marketing, accounting, etc.) must structure innovative and dynamic programs and curriculum that require students to exhibit components of the exact same pool of skills, knowledge, and attitudes needed in competitive organizations. Students must have numerous opportunities to apply those skills and they must do it early in their learning not just at the tail end of their education experience (as even good internships promote). The program that can adequately fulfill that tall order is an extensive project based program, supporting curriculum, and appropriate technology. A project based program maximizes experiential learning and matches learning while doing. Applying theory and knowledge not only helps us determine how close we can get to authentic performance but actually guides educators in the determination of the relevant business knowledge and concept areas to be covered.

Experiential learning, driven by actual business projects, is fueled by both needs and benefits. Students need to be properly trained in general and specific skill, knowledge, and attitude areas. The business community needs young graduates to be able to exhibit those skills immediately upon entering an organization. Education needs a new paradigm to deliver hard to teach but needed skills and attitudes. They also need to assess knowledge in areas of authentic application and performance. The benefits of experiential learning are numerous and can be summarized in four categories. The first category involves connecting theory and practice including providing opportunities to test and refine theories, initiate new theories, and puts concepts into concrete form. The second involves the integration of learning including challenges that require more than one set of skills or knowledge, integrating several functional areas of knowledge, and provides for an opportunity for in depth study of problems while linking real world with academics. The third category involves the use of knowledge and includes the application of business concepts (critical thinking, problem solving, team building, etc.), application of communication and interpersonal skills (presentations, interviewing, team facilitation, etc.). The fourth and last category involves learning to learn and includes collecting and evaluating data, self directed learning, inquiry and logical thinking, and reflection on experienced based learning.

The real distinction between project based programs and traditional programs are in their application, its focus on real time problem solving involving actual business projects and activities. The traditional classroom format (including more progressive technology usage and collaborative

teaching methods) is not equipped to teach newly identified skills which businesses require (risk taking, project management, change management). Current efforts are largely limited to case studies, simulations, and one time internships. While these help in exposing students to business situations, each has serious application flaws.

Developing team projects focus on five key foundation principles: 1) project based curriculum; 2) multiple problem solving iterations at varying and increasing levels of expertise; 3) large numbers of students are handled within program; 4) projects driven by continuous improvement quality skills and strategy; 5) business skills and business software are introduced by Just in Time technique for project application.

Continuous Improvement as the framework

If the hub adequately provides an opportunity to explore a business problem or issue then there must be a framework to effectively demonstrate the mastering of skills, concepts, and attitudes. One successful framework is the Continuous Improvement Process. This well known and applied process is not the only problem solving/opportunity assessment process that could be used to demonstrate key business skills. It is, however, an effective application of diverse analysis, decision making, consensus, prioritizing, and data stratification.

The strength of the Continuous Improvement Process is in the standardized approach and simultaneous flexibility in applied business situations. The process can be learned by individuals and teams and consistently applied to various business situations. It supports the key project hub concept by facilitating multiple iterations of problem solving. Teams will be able to use these skills of problem solving and focus on the new experience which each business project will bring to student teams. A useful analogy might be the learning of rules for a new game before you actually play. If the rules are known then individuals can focus on the necessary skills required to compete in the game. For teams, the learning of rules occurs during multiple practice sessions where they emulate game conditions or components of the game to prepare for actual competition. In both cases knowing the rules, including strategies, allows the effort and focus to be on skills and performance.

The Continuous Improvement Process has three elements; Theory, Process, and Tools. The Theory, as canonized by Deming, Shewart, and others is demonstrated by the Plan, Do, Study, Act improvement wheel. The success indicators concentrate on effective planning of change (including what areas of a system need improvement and what are interfering causes, act on an improvement change, measuring whether the attempted change has made an improvement, standardizing the improvement and planning for continuing improvements. The Process is a standard problem solving sequence that requires a team or individual to, step by step, initiate and complete an improvement project. The discrete 7 phases of that process are 1) Defining the Process, 2) Assessing the Current Situation, 3) Analyze Causes, 4) Try an Improvement Theory, 5) Study the Improvement, 6) Standardize Improvement, 7) Plan for Continuous Improvement. The following outline is a more detailed description of the improvement process.

I. Alignment

- A. Identify system to improve/where are problems occurring
- B. Know how the system operates now!
- C. Make the system consistent
- D. Prepare for improvement

II. Improvement

- A. Define the system that needs to be improved
- B. Identify the system's performance right now
- C. Analyze causes that keeps the system being studied from performing as desired
- D. Identify improvement ideas that will eliminate cause(s)
- E. Try out your improvement idea
- F. Measure whether your idea actually improved system
- G. Standardize the idea so that everyone does it the same way all the time
- H. Find / Plan for other improvement areas

The final element is the tools component. This component is the facilitator between the concept and process application. The tools provide teams with a means to work through complex problems, information, and issues. The tool categories are group consensus seeking tools (brainstorming, nominal group technique), data gathering tools (check sheet, run chart, sampling), data analysis tools (histogram, control charts, chart interpretation, cause and effect diagram, pareto diagram, scatter diagram, capability analysis), standardization tools (flow charts, operational definition), planning tools (affinity diagram, relations diagram, systematic diagram, force field analysis).

Off Site Project Management

Technology has changed the way we work, changed the way we communicate and now it is poised to change the way we learn. After several years of initial pilots then the integration of actual business projects as hubs into university business curriculum we took the opportunity to reflect on key successes and failures. We surveyed participating students, businesses, and faculty. The projects were performing as anticipated in several areas; the projects were dynamic, retention was higher, and motivation was measurable higher. In addition students demonstrated skills in project management, team building, problem solving, and situationally applied industry skills including statistical analysis, market survey designs, and promotion planning. Some of the barriers to successful project completion for business student teams included limited access to information after the project began, limited access to key employees of the participating business, and the sensitivity of dealing with local proprietary company information. For business participants there has been an increased emphasis and disappointment with the actual financial impact, the degree to which there has been new skill transfer of their employees, the degree to which there has been individual and organization improvement, and the one dimensional nature of our project work (marketing and marketing research emphasis). The transition from local projects to off site projects was a direct response to our previous efforts and yielded several specific objectives; broaden our scope of problem solving expertise, provide training to the business team as well as our student teams, reduce proprietary information as criteria for information sharing, increase actual team time with participating business representatives, and more directly work on, as well as, measure bottom line improvements in business processes.

In general, the offsite projects function the same as a local project. There is a project hub represented by a business problem area, a facilitation component represented by the university project team, and a business information source represented by the business client. The significant differentiation is the location of the business client, the level of interaction between student facilitation team and business client, and the communication medium. The differences are slight, the impact and potential are tremendous

Offsite Project Pilot Description

The Participants and their roles

Ohio University

Brian R. Hoyt, Assistant Professor Business Management - Team Project Manager

Jodi Hewitt, Business Management Student - team member

Jodi Poling, Business Management Student - team member

Mark Stockman, Coordinator of Computer Services & Instructional Technology - Technology Support Leader

The Ohio University team is providing the problem solving facilitation, moving the other participants through the continuous improvement process. The facilitation includes the introduction of each improvement phase, selection of tools, instruction of tool usage, integration of project information, and business software prompts and training.

North Central College

Jerry Thalmann, Associate Professor Accounting - Team Project Leader

Britt Calstrom, Accounting Student - team member

Sergio Marino, Accounting Student - team member

The North Central College team is providing the accounting expertise, working within the continuous improvement framework, providing information gathering activities, data analysis activities, improvement theories, and generate specific output.

Oatney & Wasem CPA's, Inc.

Penny Wasem, Partner - business client contact

Oatney Wasem provided the initial business opportunity, provides access to company information, and participates in the problem solving process.

Project Background:

The Client company is a diversified public accounting firm with experience in comprehensive taxation, estate taxation, financial and tax consulting, retirement and estate planning, profit share administration, business development consultation, accounting software support, and payroll reporting. After the Ohio University team facilitated the project selection (including brainstorming, affinity diagram, project criteria selection) with our business client they began the problem solving process with the Illinois college accounting team. The Ohio team prepares for each session by

communicating to Illinois via e-mail using a project schedule (on Microsoft Project Management). The schedule has the summary tasks, sub tasks, work activities, assignment of responsibilities, projected duration to complete tasks, and the sequencing of tasks. This alerts the accounting team to areas that they need to study, activities to do before the offsite meeting, and what activities will be performed during the next active offsite project management session. When the session begins (all participants are logged on to Net Meeting at pre arranged meeting time) the video and audio are set up, the chat line is used to start meeting (and document minutes, etc.) and provide reminder of session's agenda and activities. The Ohio facilitation team loads up any software needed during that session and establishes sharing and collaboration "rights" and begins the session. A typical session would introduce the continuous improvement phase, introduce possible tools to be used to move through problem solving activity, and provide an example of the output that the accounting team will be delivering. If any information is needed from the business client to clarify, add to, or change their activities then the business sponsor is included in the day's session. Whatever brainstorming, analysis, decision making, consensus, or data stratification is needed is performed on line with the necessary software applications. Each session's output is printed out and saved for each participant. Assignments are given out to do for the next session and a review of the project schedule takes place to verify that the project is on time. If any adjustments are needed they are made by the Ohio facilitation team in conjunction with the business client. As the teams move through the problem solving framework of continuous improvement they are exposed to and have opportunities to exhibit levels of expertise in various business software applications. Students may be using the software to demonstrate (Ohio team) or to analyze data (Illinois team). A typical selection of software used on a project includes presentation software (i.e. PowerPoint), analysis software (Excel, Statistical Process Control, SPSS, Flowcharting, Cause and Effect), planning software (Project Management), and word processing software. In addition students raise their level of proficiency in using a wider breadth of e-mail capabilities (attachments, etc.). A final presentation of the project's activities, findings, and recommendations is included in the offsite project management plan.

The Technology

The Internet is fast becoming a great leveler within education and society. With access to the net a person or organization is immediately given exposure of the world. An organization with a limited budget but Internet access will have the same information and resource base as its wealthy counterpart. The net can actually become a more significant attribute to the smaller organization by providing access to information or specialists that the larger organization may already have in-house.

Although the smaller organization may not be able to afford the high powered tools for extreme use of computing networks, alternatives are available that will provide similar outcomes. This is the ideology used in these methods of curriculum development and team building. The technology we are employing is very simple yet produce the desired results.

In this situation we are utilizing WAN (wide area network) tools to enhance the learning outcomes for business students. Because of the relatively small size of Ohio University-Lancaster, the class size does not properly reflect the diversity of the workforce. To simulate this diversity and to get the students familiar with the usage of the Internet, virtual project teams were established with students at North Central College. These teams will use the Internet to work together on business projects.

This project will use Microsoft's Netmeeting software to accomplish a number of tasks. Version 2.0 encompasses three important variables that could be accomplished with other software but the one package makes the job much less confusing for the students.

Real-time Internet Chat

The virtual project teams will use text based chat to work together on class projects. Netmeeting utilizes text based, real-time communication where any number of individuals can participate, and from anywhere in the world. These meetings are easily logged and can be used by the teams to keep a concrete itinerary of their work.

Application Sharing

The teams will work together on document preparation and editing for their projects. For example, using this technology, the entire team will be able to work on its project plan in a real-time mode. The document being worked on will appear on all participants' screens and anyone can make changes. When the plan is complete each of the team members can save the work locally to retain a copy.

Videoconferencing

The teams will use small computer video cameras to provide a visual image of each other while the project meetings are taking place by sending video streams through the Internet. Although the quality and refresh rate of this technology isn't perfect, the idea behind it is to give the teams an image of their virtual teammates reducing any bias some may have against the electronic medium.

All of these capabilities are accomplished with a PC with Internet access. Additional hardware and software include:

Connectix Color Quickcam \$200

The video camera used for video conferencing.

Microsoft Netmeeting Shareware

The software which allows for video conferencing, application sharing, and text based communication.

With an understanding of the Internet and its capabilities, this is the type of project and learning that can be accomplished, even within the small university or organization.

Summary:

The opportunities that this technology support system has provided has exceeded even our expectations. In a short amount of time students are exhibiting better retention of knowledge areas, higher levels of motivation, and an ability to more effectively transfer their learning to other application areas. We have been able to address two key issues in team problem solving and project management. One key issue is the speed of teams finishing projects and the other is the stamina of

team members to stay both focused and energized during the whole project experience. Both teams experienced several benefits of interdisciplinary projects and demonstrated skill development in team building, decision making, critical thinking and problem solving, conflict resolution, various business software applications. The accounting firm will not only have solutions for there opportunity area but have had opportunities to receive training during the project. The offsite project management is more than video conferencing, it has enabled students to participate in actual business problem solving that could not have been accomplished without this electronic support. Students, faculty, and business clients legally receive exposure and usage of business software not readily available to them. We are driving change in the delivery of business education, using advanced technologies, but not losing sight of our sole purpose; provide effective training to business students that exactly mirrors the skill, knowledge, experiences, and attitudes expected of successful business people in the workplace.

Using Authorware and Shockwave to Create Interactive HTML Pages

Janet E. Hurn
Physics Instructor
Miami University
4200 E. University Blvd.
Middletown, Ohio 45042
(513) 727-3341
jehurn@mumr2.mid.muohio.edu

Abstract

My goal as an instructor is to increase student learning by improved teaching methods. One road block to improved instruction in my introductory physics courses is that some of the student's learning styles are not being addressed with my delivery strategies. Another problem that has become more significant is that my students commute and tend to work and/or have family obligations as well as their school responsibilities. This restricts the hours that they can study and do homework. A third problem I have encountered is that commercial teaching materials such as computer software or video materials are usually costly and are not tailored to me or my students' needs. The solution I have found to solve these problems is using Authorware to produce interactive computer tutorials. This paper focuses on these problems and why I have found this to be a reasonable solution. I would like to point out that Macromedia, the producers of Authorware and Shockwave, have in no way sponsored or influenced this paper nor am I trying to advertise for their company.

Problems

Miami University Middletown is a regional campus of Miami University located in south western Ohio. The campus is totally a commuter campus with a combination of traditional and nontraditional students. The nontraditional students are older and tend to have full or part-time jobs and family obligations. Many of the traditional students have jobs as well. I teach an introductory algebra based physics course and an introductory calculus based physics course with accompanying laboratories. The students that take my courses are from a variety of backgrounds and majors. The majority are pre-health field majors or 2 and 4 year engineering majors. This varying array of students brings with them a variety of instructional needs and challenges.

One of these challenges is meeting the variety of learning styles these students possess. I have found this to be especially significant in physics. There is a lot of information and research on learning styles based on D. A. Kolb's original work. I will not go into much depth here. There are three general ways that students receive information: auditory, visual, and kinesthetic. Students tend to favor one of the three. It is not sufficient to just lecture [1]. This only helps the visual and auditory learners. But even the visual depictions are not sufficient when talking about two or three dimensional subjects. I have seen this first hand in my courses. Drawing a graph of position versus time for a moving car is not as effective for some students as seeing a toy car drive across the desk.

It is impossible to teach all topics in all three modes. And what about those students who need to see it several times? Computers can show some of these more complex topics with ease. For example showing how vectors add or harmonic motion relates to circular motion can be shown with animations for the students to repeat as often as needed.

Another challenge is meeting the diverse scheduling needs of my students. Our campus is nonresidential and our students commute anywhere from 5 minutes to an hour away. We serve part time and full time students and offer classes from 8:30 a.m. to 10:00 p.m. This means that our students may be needing assistance at 2:00 a.m., or 6:00 a.m., or whenever they can squeeze a moment to study. Well, I do not keep office hours like that, but the Internet is always available. It allows students to study at their convenience and at their own pace. That is very important to our mission as a University.

The last challenge is that there is an overwhelming amount of commercial computer material available for instructors. I have found it to be costly and difficult to fit into my curriculum. This is very frustrating. It is time consuming to screen all of the material. I am not saying there is not good software out there, but if it drives changes in my content and teaching style, it is not helpful. By creating my own materials, I can tailor it to how I teach and what I teach. I still use some commercial materials, but it really is worth the time to me to match my classroom work.

Solution

I looked to the computer to solve these problems. It is capable of delivering sound, video, and text to address varied learning styles. The Internet can deliver material at nearly any location at any time of day, and I can create materials that match my curriculum and teaching style. The task was to choose the software to create this material and find out how to deliver it over the Internet with relatively good speed.

I look for three things when I am evaluating developing software for classroom use: functionality, learning curve, and cost. If a program is very powerful but takes months to learn, then it is not very useful. On the other hand if it is very easy to learn but not very functional, that does not solve the problem either. Budget is always a concern and software must be affordable. Unfortunately the more functional the software, the more expensive it seems to be. Fortunately some companies offer educational versions of their software at reduced rates.

I can not claim to have investigated all the available software on the market, but I did look at many different programs and options. I also talked with other instructors and computer "gurus" including some students to find out what was out there. The software I have decided to use for developing applications is Authorware by Macromedia.

Why Authorware?

Authorware is an extremely powerful developing tool. It is what I would term a nonlinear interactive presentation developing package. Let me explain. Programs such as PowerPoint are excellent presentation packages but are linear. You can only go forward or backward. If the learner wants to go to another part of the program, they must move forward through the rest of the program to get

there. There is no branching. I wanted more student control. Students will get frustrated if they cannot make some choice about where they go or repeat some topics they may have missed. Authorware allows for branching. A student can choose where they want to go next. I can also change the program direction based on students' input.

Another part of its functionality is its built in variables and functions. It automatically sets your program up to track several variables. This is very helpful when tracking scores. I can also set up my own variables if I choose to get that complicated. Functions can help the users run the program or perform specific tasks.

Authorware allows you to animate objects, embed sounds and video, and receive user input in multiple ways. The animation feature may sound like nice bells and whistles but I find it a very useful innovation. It allows for illustration of motion of various objects which is very useful in physics. For real life motion or demonstrations, short video can be embedded. The feature that adds flexibility and interaction is the user input. Students can interact with the material by answering questions, matching terms, or building lab models. The possibilities are endless.

Authorware is obviously functional, but is it very user friendly? I must admit that my first encounter with Authorware was less than friendly. But in that version there was no online help and the written manuals were not always helpful. But this new version has online help and complete manuals. The learning curve is not completely smooth but is not as steep as many other programs with the same functionality. Another nice feature is that even if you only master the basics, you can still produce useful applications. Director, also by Macromedia, has a steeper learning curve to me and requires scripting for more complex actions. I find this to be a huge deterrent. Authorware is icon based. Give me picture programming over a text based language any day. Figure 1 shows an example of an Authorware program flow line.

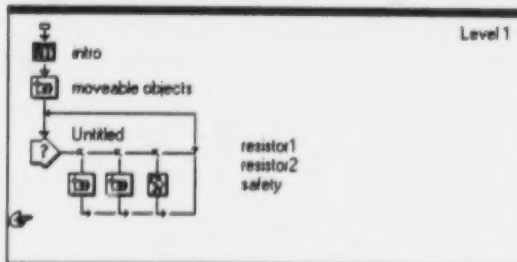


Figure 1

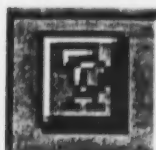
This figure shows that it begins with some introduction group followed by some moveable objects and then a question requiring student input. No programming knowledge needed. And if you forget something, Authorware will remind you that some direction is needed at a given point as the application runs. One of the best advantages is that Authorware comes prepackaged with some useful educational applications that can be inserted into your application or fitted with your material. You do not have to reinvent the wheel, just modify the paint job.

Other programs which could be considered are Asymetrix Toolbook, HyperCard, and Visual Basic. Visual Basic involves much too much programming for my tastes. I know a lot of instructors who like Toolbook. It is a HyperCard clone. It is much more expensive than the Academic version of Authorware.

That brings me to price. Let's face it, there are not a lot of large budgets in academia. Price is a driving force in choosing equipment. Macromedia has met that need by providing academic versions of their production software. Authorware is a \$900 program, a prohibitive cost for most budgets. But their Authorware Academic version is about \$150. There are a few differences between the two versions. Authorware Academic is limited to 350 icons which I will never approach, and there is a 20 variable limit. The only limit I find frustrating is the lack of Open Data Base Connectivity. This would allow you to connect with a data base and keep track of student progress more easily, but there are ways to get around this limitation. Finally you cannot create a completely executable file like in Authorware. You have to include the RunA3W file with your final application. This is a minor inconvenience.

Producing an Application with Authorware Academic

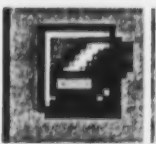
Obviously I cannot cover all the specifics of producing an Authorware application in this paper. But I will give an overview that captures the essence of how Authorware works that would allow the ambitious to experiment [2]. There are only 13 main icons in Authorware which is remarkably simple for the functionality of the program.



The **display** icon is placed in the flow line where you want to put any type of pictures or text. The major thing to remember is that it is helpful to give a set of text or a picture its own icon. It makes things easier later.



The **motion** icon is what makes animation so easy. It adds life to the traditional black board examples. Text, objects, or movies can be moved in a variety of ways. It is not just for flash either.



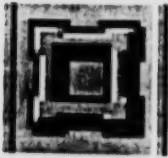
The **erase** icon just erases what you no longer want on the display. It comes complete with fancy transitions.



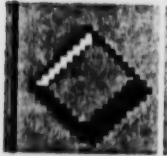
The **wait** icon slows the program up for a given amount of time or until the user is ready to go on.



This **navigation** icon is used in conjunction with the framework icon to navigate an application. It allows you to mimic the HyperCard structure of other programs.



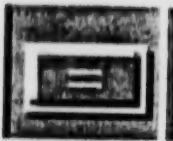
The **framework** icon is used to mimic the HyperCard structure.



The **decision** icon allows for change in path depending upon conditions or events.



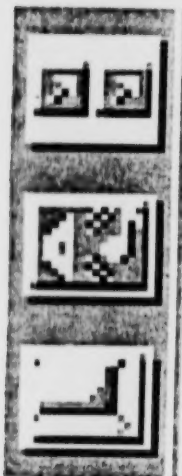
The **interaction** icon is the key to interactions with the user. Students can respond to questions and get feed back on their choices.



The **calculation** icon is used for more complicated actions. It can manipulate variables and run functions.



The **grouping** icon makes the program more manageable by combining icons into a group.



These three icons allow you to place video and sound into the flow line and the third allows you to start up external video tape from within the application.

BEST COPY AVAILABLE

To create an application you combine these icons into a flow line in the order you want them to appear. As you begin to create you can run the application at any time to see exactly how it is going to look to the user. If more information is needed, the application stops and asks you for the missing information. It is best to start out simple and build. Another way to learn is to look at some of the applications included with Authorware. They are especially geared toward education. Some of them are structured so that all you do is add your material. You can use materials that you have already created. Bitmap (BMP) graphics can be cut and pasted into Authorware and text can be inserted as long as it is in Rich Text Format (RTF). This can save time if you happen to have notes or handouts that you would like to put into your application.

Once your application is running as you want it to, you must package it. It becomes a file that can run on any computer. You must include the RunA3W program with your file, but that is not a big deal. You can distribute your application on disk, as long as it is small enough, or put it on a server for network use for your students. This in itself is a nice feature but I think the real advantage is putting an application on the World Wide Web.

Afterburner/Shockwave

Afterburner is a small freeware program put out by Macromedia. It is available from their home page [<http://www.macromedia.com>]. Afterburner takes your packaged Authorware piece and takes it one step farther. It breaks into "chunks" that are of suitable size to send over a Intranet or Internet without considerable time lag. It also creates a mapping file that keeps it all organized. These "chunks" and the mapping file are then placed on a server. Some minor things must be done to the server in order for this to work, but I will leave that up to the programmers. It is outlined in Afterburner.

The next step is to embed your piece into an HTML document. You must use the embed tag as illustrated below.

```
<embed src = "name of your file" width = ### height = ###>  
</noembed> </noembed>
```

You must specify the height and width of the window for the browser to show the whole piece.

Finally, in order to view the final piece with a browser, you must install the Shockwave plugin on your computer. This is one of the most popular plugins and will probably become standard issue someday. It can also be downloaded from Macromedia for free. The students should not have too many problems taking care of this, but some instruction may be warranted. Now you are ready to view your piece and interact with it over the Internet.

Intranet Vs Internet

The Internet is the world wide system with which we can all have access. An Intranet is a system of linked computers that is smaller and usually confined to a computer center or classroom. It is separated from the Internet at large. Bandwidth is the concern. Bandwidth deals with the amount of data the network cabling can transmit in a given amount of time. Any piece that you create would be fine for an Intranet because bandwidth is not an issue and the download time is not as long. But if you start creating elaborate pieces with video and sound, be aware that the download time over the Internet could be long depending again on bandwidth. I try to keep it somewhat

simple so that is not such a problem. I am presently experimenting with short video pieces. These could create a problem. My rule of thumb is that if it takes longer than a minute to download it will frustrate the students. Shockwave avoids some of this by downloading packets at a time.

Conclusion

The World Wide Web is the hottest topic in business, education, and information systems. The extent of its impact on our society is yet untold. We as educators can use this technology to improve our delivery of information to our students. There are many ways to utilize Internet technology in the classroom. Several advantages of the Web is that it can address student's various learning styles. It is possible to be visual, auditory, and kinesthetic to some extent. The Web is also very flexible. A student can work on material from the Internet at any time of day or night. This flexibility is especially valuable when the students commute or work as well as attend school. The Web can merely function as a video "book" or it can require interaction by the user. This is where the Internet can become a powerful teaching tool. Dissemination of information is not the only goal of teaching. Involving the student in the educational process is essential.

References:

1. Sternberg, Robert J., "Allowing for Thinking Styles," *Educational Leadership* (November, 1994).
2. Allen, Michael W., Authorware Academic Users Guide Version 3.5, Prentice Hall, Upper Saddle River, New Jersey, 1996.

Power Pedagogy: Integrating Technology in the Classroom

Benjoe A. Juliano, Ph.D.

Department of Computer Science, Coastal Carolina University

P. O. Box 261954, Conway, South Carolina 29528-6054

Tel: (803) 349-2144, Fax: (803) 349-2455

E-mail: Juliano@ccucs.Coastal.edu

Abstract

Classroom instruction has come a long way within the past decade. Connectivity on the Internet through the use of WWW browsers is becoming commonplace in the classroom, at home, and in the office. In this paper, the author looks at the use of the Web to supplement traditional instruction. The focus is on the use of Web pages as an intranet teaching tool that establishes an extension of the regular classroom. This facilitates distribution of electronic supplements to students in a class, as well as the collection of survey responses to regular class assessment by the students. On the internet side, Web pages provide a medium for distance learning and an advertising tool to attract prospective students. Some pointers and suggestions from the author's experiences are also discussed.

1. Introduction

One cannot help but stop and notice the amount of change that continues to occur in today's classroom instruction. It seems like only a few years ago that there was only one major classroom model. This was the traditional classroom model that required regular meeting between the instructor and the students at a prearranged site or room. Changes in technology are apparent not only in today's classroom. It is also impacting instructors, students, curriculum, and teaching methods.

What, then, is "power pedagogy"? The term refers to any set of instructional methods designed to increase faculty productivity and to accommodate more students with existing facilities. This is in line with the "do more with less" (Bothun, 1996) dilemma facing most colleges and universities. With these methods come a set of technology-based tools, hence the phrase in the title, "integrating technology in the classroom." But perhaps even more noticeable than the use of technology in the classroom is the use of technology to augment the traditional classroom. Most people refer to this extension of the classroom as "distance education" (Bothun, 1996 and Chizmar & Williams, 1996) or "virtual classrooms" (Juliano & Sheel, 1995). In this scenario, students are located in one place while their teacher(s), peers, or other instructional resources are located in another. A number of different technologies are involved and, depending on the arrangement, it can be useful in a wide range of learning situations. The most common tool used to implement this is the World Wide Web. In the next section, we briefly discuss the technology that makes the Web work and then follow it up with its impact on technology-based instruction.

2. Telecommunications and Network Technology

Traditional classroom instruction through print media could have been considered power pedagogy even up to a few decades ago. As an extension to the Socratic method of teaching, print media facilitated the dissemination of information. The next step in enhancing the traditional classroom model was to include the use of audio technologies, such as radio, audio cassettes, and, of course, the telephone. However, with the exception of the telephone, audio-based distance learning is noninteractive. Now, when audio is combined with video, as in the case of television, the result can be similar to that of interpersonal instruction. However, again, there is no potential for interaction, unless additional technology is used. Despite this drawback, television-based distance education is one of the fastest-growing segments of the industry.

The next level of sophistication is to use satellite and cable. Satellite technology increases the instructional coverage area significantly (Wu, Miller, Pritchard, & Pickholtz, 1994). In a similar but smaller extent, the use of fiber-optic and coaxial cable to distribute video materials in cable television systems facilitate receiving programs from many sources, including satellite, for distribution to any subscriber. In this arrangement, the instructor conducts a class session "live" in front of a video camera. The course is then uplinked to a satellite, from which it is sent to the subscribing schools' satellite dishes. Such a course may then be sent out to additional learning sites over cable. This can further be improved through the support of two-way teleconferencing. Combining two-way audio and two-way video demands so much bandwidth to transmit. However, this also extends the traditional classroom by allowing students to ask questions or respond to the teacher in real time.

The use of network technology is another way to enhance traditional education. This encompasses the use of electronic-mail programs that allow users to send and receive information on a non-real-time basis and the use of the Internet to share and exchange information. The popularity of network technology stems from the fact that it is relatively easy to implement. All users need is a computer account, or a modem and a personal computer. This is fairly minimal equipment, considering that one can share and access assignments, critiques, and much more across the country and even around the world. This is precisely why connectivity on the Internet through the use of Web browsers is becoming commonplace in the classroom, at home, and in the office.

3. Power Pedagogy = Technology-Based Instruction

Only recently has technology-based instruction been gaining recognition at Coastal Carolina University (CCU) in South Carolina. The campus network currently supports over 2,300 users. Web

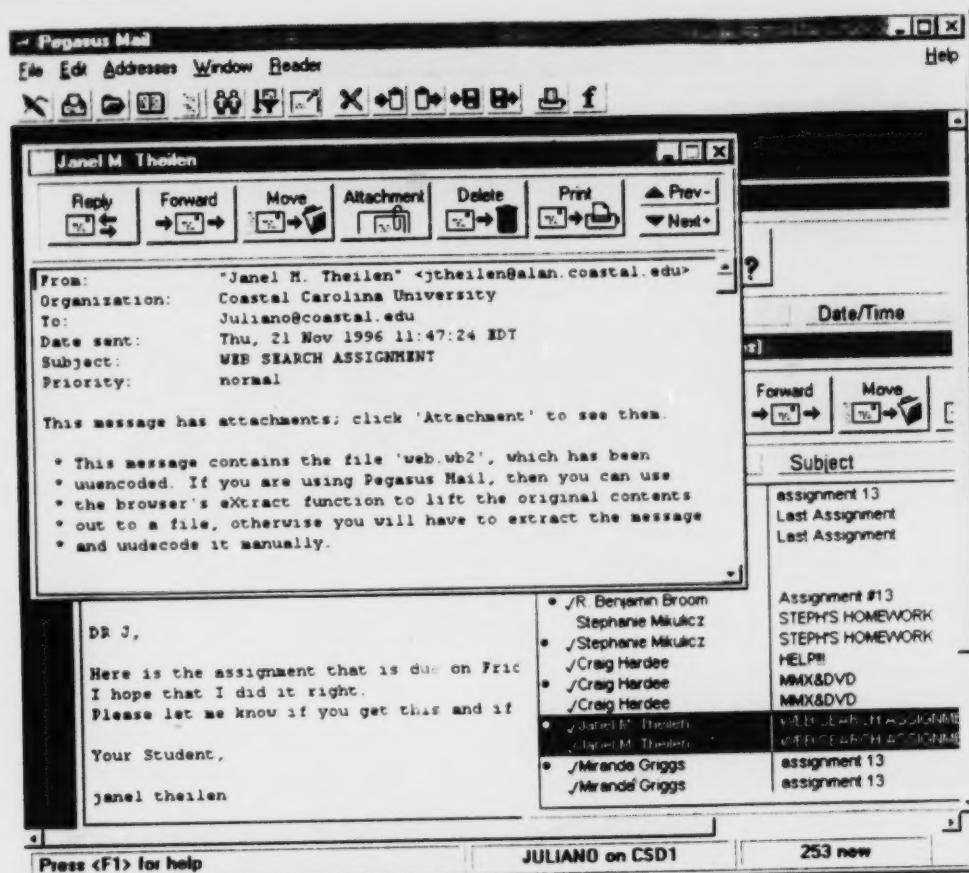


Figure 1 Submitting assignments as e-mail attachments in Pegasus Mail for Windows.

access was a service made available to students, faculty, and staff less than two years ago. With its introduction, new forms of curriculum delivery and student learning that centers on the use of technology are being considered. Here is a list, adopted from Chizmar & Williams (1996), indicating some of the learning activities possible when employing technology-based instruction:

- ❖ private newsgroups for each class
- ❖ electronic-mail collaboration between students, between students and faculty, and between faculty
- ❖ electronic mail submission and critique of work
- ❖ video- and/or teleconferencing
- ❖ electronic posting of grades, class handouts, notices, schedules, etc.
- ❖ electronic exhibit areas for class projects
- ❖ Internet-based lab work and research projects
- ❖ Internet-wide critique of work

How does CCU implement these activities in our classes? As of this writing private newsgroups are not supported, but individuals with University computing accounts can access Usenet newsgroups through a public news server. E-mail collaboration is facilitated by the Majordomo mailing list manager on a DEC Alpha minicomputer running Digital Unix. This mailing list manager allows

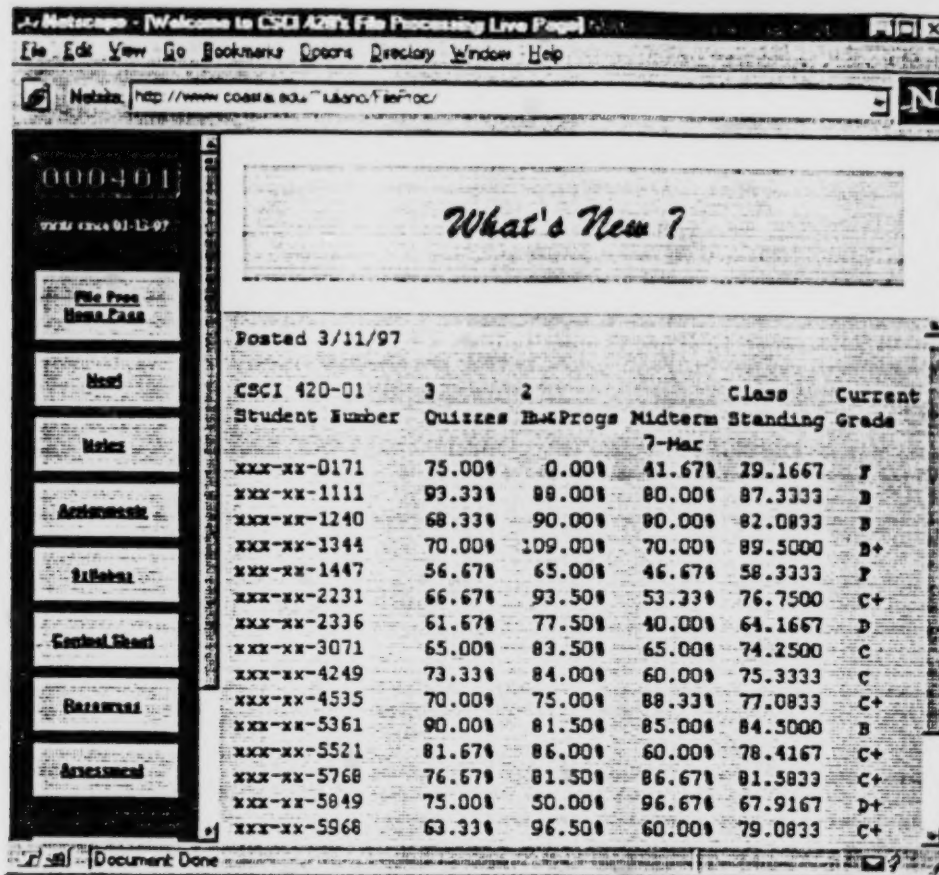


Figure 2 Using a Web page to post grades.

faculty to set up their class mailing lists so e-mail messages can be broadcast to all students registered in that class and the professor. The package was also used to set up mailing lists for specific majors, faculty in specific departments, as well as academic organizations and clubs. Several departments have also set up jobs mailing lists for their students. Major-specific job openings, whether local, regional, or national, are distributed through this medium. Most faculty use Pegasus Mail for Windows running on the University's Academic LAN when sharing (drafts of) documents that pertain to a project they are collaborating in, or even working documents for a University committee they are participating in.

E-mail is also used for the submission and critique of assignments and similar work. For example, in the Department of Computer Science, all courses that incorporate programming in the Unix environment require that these assignments be submitted via e-mail. In our Computer Applications class, students are sometimes asked to submit their wordprocessing or spreadsheet assignments as attachments in Pegasus (see Figure 1). Comments, criticisms and suggestions can then be sent back to the students via e-mail. CCU also offers some M.B.A. courses in its joint program with Winthrop University through distance learning (DL). A DL-enhanced classroom housed in the CCU campus is used. The facility supports two-way teleconferencing and has proven quite successful.

The last four items in the list above are best implemented as Web pages or components of Web pages. As an example, the author uses course-specific web pages to facilitate posting of grades (see

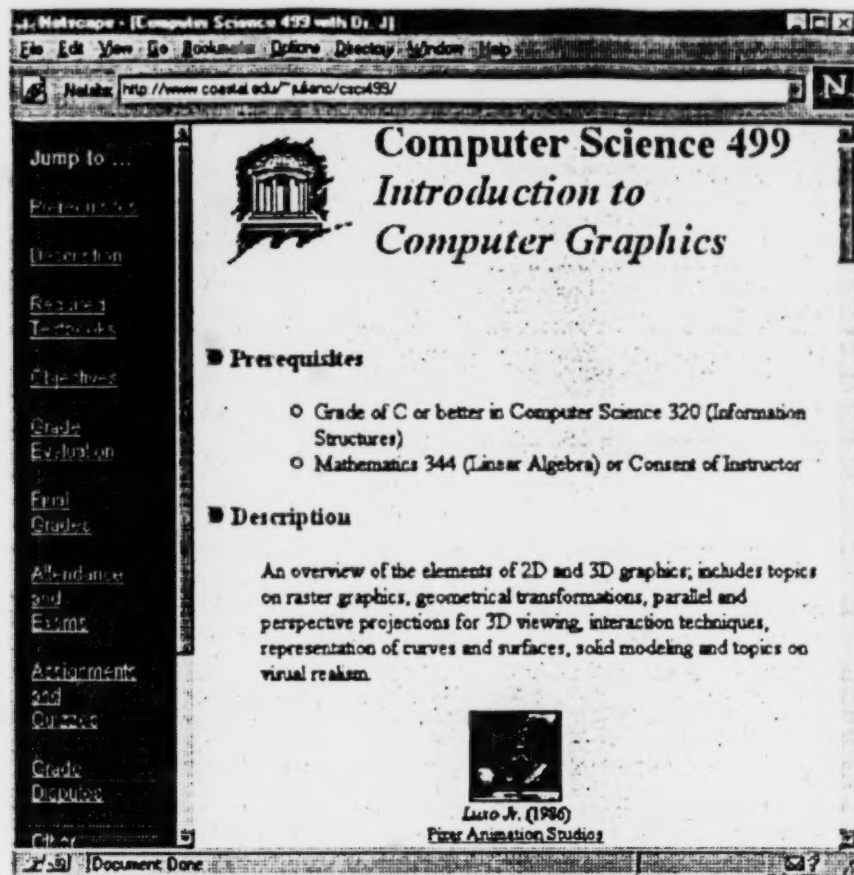


Figure 3 Presenting course syllabi on the Web.

Figure 2), distribution of announcements and class notes/handouts, course policies and course syllabi (see Figure 3), and other similar material. The author is also planning to use Web pages to feature and exhibit Computer Graphics class projects as well. Internet-based lab work is conducted on a regular basis by students and faculty in some departments of the School of Science. Through a web browser, one has access to real time data that pertains to the weather, the oceans, and other scientific information. Live stream audio and video allows the viewing of current events, on-line speeches and debates, and even concerts. Lastly, Internet-wide critique of work is done by some faculty by providing HTML versions (also plain text, postscript, or Adobe *.pdf files) of their papers or articles for review by other people who access the Internet. Of course, various combinations of the above activities are also possible.

When is technology-based instruction appropriate? Using the time and place categorization by Chizmar & Williams (1996), technology-based instruction seems most appropriate in all categories except the same-time/same-place category. This means non-traditional learning environments where the time and place of instruction are not both the same for educators and learners. Here are some examples:

- ❖ To mitigate geographical isolation in same-time/different-place scenarios. People in remote, rural areas either are simply unable to attend school or have access to only a very limited curriculum offering. Technology-based instruction (and distance learning, in particular) facilitates full participation in the educational process.
- ❖ To resolve scheduling conflicts that are characteristic of different-time/different-place situations. Adult learners in particular often deal with numerous scheduling conflicts: job, family, and other commitments can make it difficult for them to find the time to attend conventional classes. With distance education, such learners have a greater degree of control over their own educational process and pace.
- ❖ To distribute scarce, or unique, instructional resources. Rare and precious art, data collected by NASA, specific regional information from the Census Bureau, current exchange rates, and even stock market quotes are just a few examples of information that can be accessed from the Web.

Technology-based instruction facilitates broad distribution of curricula and related materials. In essence, it "alters the limitations of time and space" (Chizmar & Williams, 1996).

4. Discussion

The integration of instructional technology in the classroom has been met with both excitement and resentment by various University constituents. The general reaction people have for those who readily embrace technology is one claiming these believers "have too much time in their hands." Another reaction is one of doubt that this technology will ever last for a reasonable amount of time as developments and modifications occur at an exponential rate. On the opposite side of the spectrum, those who do not readily integrate technology in instructional environment are generally labeled as "set in their ways" to the harsher "afraid of change." Those in administration also fall in one of these two extremes: those who favor technology tend to do so for political and/or P.R. reasons, whereas those who do not favor technology tend to do so because of the initial costs involved.

Since "power pedagogy" refers to any set of instructional methods designed to increase faculty productivity and to accommodate more students with existing facilities, we can use the list of advantages and disadvantages of using instructional technology outlined by Bothun (1996) based on his experience and involvement in the development and maintenance of networked courseware at the University of Oregon. These are presented next with some comments regarding the author's own experiences and observations at CCU.

4.1 Advantages of Power Pedagogy

"1. Technology-based instruction facilitates direct manipulation of real data using real analysis programs as part of the regular classroom presentation. Furthermore, it allows the professor to customize a curriculum to center on his or her particular area of expertise." (Bothun, 1996)

As indicated earlier, Internet-based lab work is conducted regularly by some Department of the School of Science. In particular, a Marine Science professor teaching Environmental Ecology uses a web browser and computer projection equipment in his lectures to show real time satellite data about the earth, currently changing weather, etc. to illustrate and emphasize concepts introduced and discussed in class. Similarly, classes can tune in "live" on the keynote speaker's address at the recent JavaOne Conference in San Francisco or the landing of the space shuttle after completing its most recent mission - depending on how these pertain to course content. Currently, CCU has not reached the point where personal research data of faculty are made available and accessible to the students as part of the curriculum. The author predicts that this direct integration of research into teaching will occur soon.

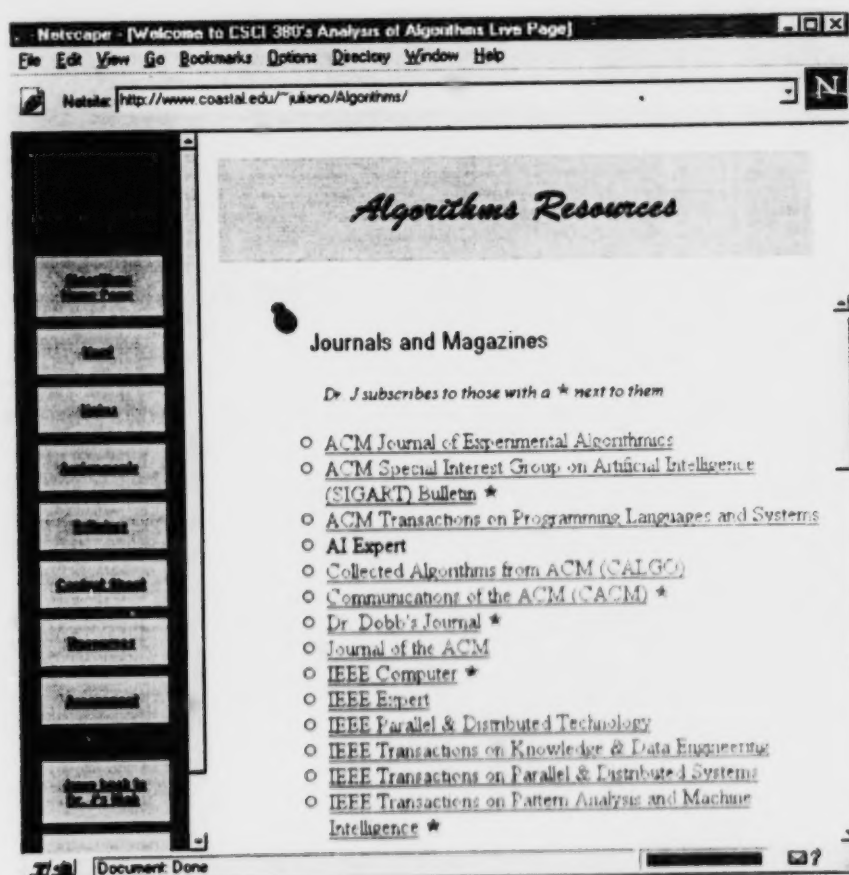


Figure 4 Using Web pages to provide a list of useful resources for a course.

"2. Software, such as web browsers, allows for an extremely convenient way to organize, prepare, and present lectures. One can easily integrate text with graphics and animation into one seamless presentation." (Bothun, 1996)

The use of overhead projectors and computer projection systems was considered a significant improvement to the traditional blackboard system. The technology was welcomed by today's MTV

generation with no hesitation. An extension of this is to use web browsers to deliver instruction. So far, no one at CCU has turned to Web browsers to present their lectures. Some have made instructional materials like lecture slides (possibly in Microsoft PowerPoint or as a postscript file) available on-line. Some professors have printed out Web pages for use in their lectures. The author has done this, whenever appropriate, and has also made it a point to include a list of resources for all upper level classes being taught in each semester (see Figure 4).

Dr. J's Class Assessment Survey

File Edit View Go Bookmarks Options Display Window Help

Netscape: <http://www.coastal.edu/~jlane/assess.html>

Our Class Is ... **CSCI 380 (Intro to Algo Analysis)**

	Strongly Agree	Strongly Disagree
Today's Class		
I understood concepts covered today.	1 2 3 4 5	
I see how I might apply this material.	1 2 3 4 5	
Class learning methods were appropriate.	1 2 3 4 5	
The Professor		
Well prepared and organized	1 2 3 4 5	
Showed enthusiasm towards the subject	1 2 3 4 5	
Encouraged open class interaction	1 2 3 4 5	
What is the most important thing you learned today?		
What is the <i>muddiest</i> point still remaining at the conclusion of today's class?		

Document Done

Figure 5 A sample class assessment form.

"3. Web-based courseware seems to better engage the more motivated students, and they end up making a contribution to the curriculum." (Bothun, 1996)

Web-based courseware includes course materials developed by both the professor and any of the students enrolled in the class. Assignments are given on the Web and students may set up their own Web pages featuring any information they found themselves. The author cannot support the above statement since web-based courseware have not been developed at CCU, thus far.

"4. The use of technology in teaching facilitates the development of a dynamic core-course curriculum, which can react almost instantaneously to feedback from students and other professors." (Bothun, 1996)

Syllabus sharing is something educators have been using the Web for. It is very likely that someone has posted on the Internet a syllabus for a similar course one intends to teach. Individuals around the globe post their most recent syllabi and other course-specific materials. One can assess their current syllabi by comparing it to others around the world. In one occasion, a professor from another University got in touch with the author asking permission to use his Computer Graphics syllabus in designing their own course. The author has also used the Web to collect information on designing a syllabus for a class in Analysis of Algorithms.

Another clear advantage of Web-based technology is the provision of a medium for immediate feedback from students. The author has successfully used a class assessment form (see Figure 5) that his students can use anytime during a semester to send feedback, comments, suggestions, questions, etc. This form was based on the "Minute Paper" used by Chizmar & Williams (1996). In this arrangement, the student is allowed to assess any particular class by commenting about how the course is going and how the professor taught that day. There are also textboxes to indicate both the most important thing(s) learned and any unclear or still misunderstood point in that day's class. The professor can then use this information to adjust lectures and class discussions accordingly. This can be done as early as the next class period.

4.2 Disadvantages of Power Pedagogy

"1. Alienation of some students." (Bothun, 1996)

Unfortunately, the availability of electronic notes, graphs, images, sound bytes, animations, etc. does not necessarily mean that students will access them and use them to supplement the learning process. Retrieving this information requires the correct hardware and software. At CCU and at other universities one cannot assume that each student has access to a computer at home. Students who have to access the Web through campus labs tend to consider this a hassle, specially if campus equipment is inadequate. Available hardware (in particular, the amount of main memory) seems to be the next biggest problem. Graphical information use up a lot of bandwidth and hence a lot of memory. This makes them practically inaccessible in older machines.

"2. Campus infrastructure needs." (Bothun, 1996)

The same hardware and software concerns in the previous item can plague campuses. A University's dedication to quality academic support, the state of campus network technology, available in-campus networking and technology expertise, etc. - these are all factors that could hinder the use of instructional technology. From an administrative viewpoint, some people find it even difficult to see the financial feasibility of making such technology available.

"3. Instructor preparation time." (Bothun, 1996)

The author has received comments such as "I don't have time to do all that" or "Where do you find the time to do all that?", among others. Admittedly, the use of instructional technology may take more time than traditional methods. Take for example the use of presentation packages like Microsoft PowerPoint. Although the use of overhead projectors may, in fact, improve the delivery of instruction, the preparation time may be a serious consideration specially in cases where the

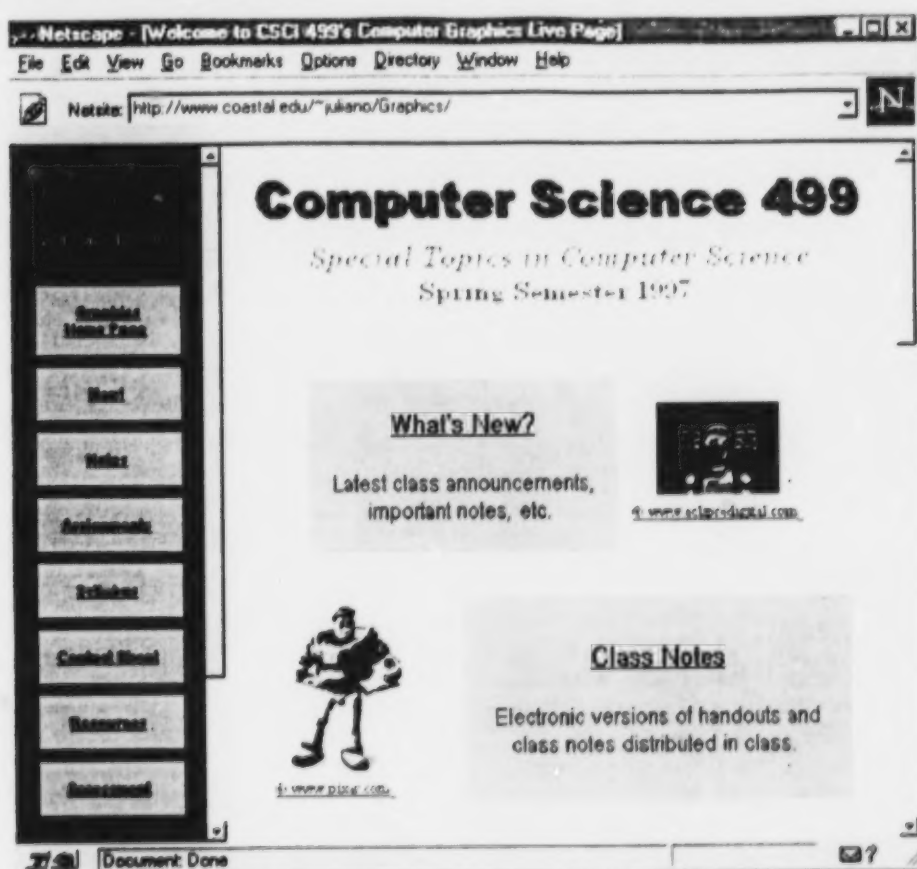


Figure 6 Using a standard template to facilitate Web page construction.

professor has to prepare everything from scratch. Most textbooks come with instructors' supplements that include transparency masters, and so this may be workable alternative.

Another example is the use of Web-based technology to supplement classroom discussion. Similar to the use of overhead projectors, the long preparation time only occurs initially and once material has been developed or a methodology constructed, then preparation time is reduced. The author currently uses a standard template similar to that in Figure 6 to facilitate Web page construction. Compare Figure 6, for example, to Figures 2 to 4. Of course, instructor preparation time also depends on the number of features one puts on their Web pages.

5. Summary and Conclusions

One cannot take extremes and either just embrace technology and welcome it into the classroom as a teaching/learning supplement, or just shun it completely as being evil! Although it seems clear to the author that the use of instructional technology in today's classrooms is the way to go, the author also is cautious in making recommendations to colleagues, peers, and others. A number of issues may need to concern us all. Perhaps the most important is the exponential growth rate in technology and the amount of online information (Berghel, 1997) that makes it difficult for everyone to keep

up with the pace. There will always be students and/or faculty with substandard computing equipment - insufficient hardware that is incapable of rendering the kind of graphics and animation everyone is getting hyped about. Not everyone will have the sound card required to listen to that audio clip. Not everyone will have the memory to handle multiple frames on web pages. And not everyone will have a Java-enabled web browser. Indeed, a picture paints a thousand words, but a graphic image tends to be an order more than a thousand bytes! The amount of graphical information in a Web page has to be considered when designing pages for use as instructional support. Some people have opted to put both text-based and graphics-based versions of their pages depending on their local hardware capabilities or user preferences. Information overload, on the other hand, results from there being too much information available online (Berghel, 1997). This raises questions of Internet credibility (Blumenthal, 1997) - there is also too much useless garbage out there! Other Internet concerns include security and privacy, policies on self-expression, etc. but these are beyond the scope of the paper.

There is a lot of potential for learning and for intellectual growth in the use of instructional technology. Support for hypermedia documents will continue to improve (Bieber & Vitali, 1997). Nonetheless, one has to get involved in Web-based technology with caution and concern, realizing its capabilities and limitations. Hence, one is to expect varying degrees of Web usage by faculty when it comes to instructional support. The first step is to provide the necessary training required to gain competence with networking and Internet technology. There will be resistance to this. At the other end, one can get involved in Web programming to design full-featured pages. This requires knowledge of new paradigms and skills (Yourdon, 1996): knowledge of HTML, programming CGI scripts, Java, etc. One can avoid having to learn all this by concentrating on developing skills in using Web browser plug-ins and tools.

Power pedagogy through the use of instructional technology can increase faculty productivity and can accommodate more students with existing facilities. In this "the network is the computer" society we live in, client/server deployment sets individuals even further from where the actual computation takes place thereby improving the virtual classroom experience. We must harness this network technology and use it as instructional support in our classrooms. This way, students are required to use the same technology they are expected to be familiar with when they graduate.

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Hype, dynamic computing, new paradigm and skills, java architecture, common development environment, flexible user interface.

An Administrative Model for Virtual Website Hosting

Jerry Kandies

Assistant Professor of Computer Information Systems

Delta State University

Cleveland, MS 38733

phone: (601) 846-4426

fax: (601) 846-4429

jkandies@dsu.deltasr.edu

Abstract

The process of creating and maintaining a World Wide Web homepage for a national organization - the Association of Collegiate Business Schools and Programs (ACBSP) is detailed. Iterations of the website's logical and physical design are discussed, as well as a variety of administrative issues. The growth and change from a file processing environment to a database environment is explained.

Marketing efforts to current and prospective ACBSP members and intra-organizational communication via e-mail and hyperlinks have been accomplished. The long-term goals of electronic dissemination of research and curriculum collaboration are on the horizon.

Introduction

Accreditation is a formal process which ensures public confidence in school programs. In the United States, institutions voluntarily seek accreditation which is conferred by nongovernmental bodies. The Association of Collegiate Business Schools and Programs (ACBSP) is an accrediting organization which specializes in accrediting business programs within colleges or universities which have already achieved institutional accreditation through regional or national accrediting bodies. Over 200 college and university business programs are ACBSP accredited.

In the spring of 1996, the Board of Directors of ACBSP selected Delta State University (Cleveland, MS) to lead an effort among member institutions to create an ACBSP homepage on the World Wide Web. Presence on the Web now serves several purposes: promotion and marketing of the organization, enhancement of membership development, communication with and among member institutions, and dissemination of timely information. Additionally, when hyperlinks to member institution's homepages are provided, the national membership infrastructure is strengthened.

History of ACBSP

According to the promotional literature of ACBSP (ACBSP History, 1995), two organizations in the United States accredit business schools and programs in colleges and universities. One, the American Assembly of Collegiate Schools of Business (AACSB), was formed in 1919. AACSB is an accrediting agency for bachelor's, master's and doctoral degree programs in business administration and accounting. The mission of AACSB is the promotion of excellence in

management education in colleges and universities. The second organization is the Association of Collegiate Business Schools and Programs (ACBSP), founded in 1988 as an alternative accrediting agency for business programs that do not have research as a primary emphasis.

Approximately 2400 institutions of higher education have business programs in the five traditional fields of business education--accounting, business administration, economics and finance, management and marketing. Specialized areas of study such as human resources management, management information systems, and public administration are also considered as business-related curricula. In 1988, approximately 260 of the 2400 institutions previously mentioned had their business schools and programs accredited and it was administered by only one organization.

Many of the remaining 2140 institutions felt that an alternative organization should be created to satisfy the business accreditation needs of their institutions. Most of these 2140 institutions had (and still have) as their primary student-oriented objective, excellence in teaching as opposed to a heavy emphasis on research. These institutions expressed dissatisfaction with the existing accreditation philosophy, requirements, and procedures of AACSB. Hence ACBSP, a new accrediting organization for business schools and programs, was created with its primary emphasis directed towards fostering excellence in teaching.

Internet/Intranet

Internationally, business and industry are examining ways to harness the Internet to improve all aspects of marketing (Wilder, 1996). Product promotion, demographic data collection, and customer service are the three most important ways the world wide network will help marketing efforts. The costs for these basic marketing functions are dramatically lower when the costs of paper-based publishing and information dissemination are removed from the equation. These cost saving advantages are perhaps even more impressive for non-profit organizations where budgets are notoriously tight.

Organizations are also adopting the idea of private, company-wide Internet-like computer networks which are referred to as intranets. These internal networks rely on the TCP/IP protocols and have e-mail systems, Web servers and Web browsers. In addition to facilitating information dissemination, intranets offer the opportunity for collaboration. An intranet goes beyond Internet access by offering a concentrated TCP/IP network that is focused on a company's business interests. Intranets are one of the fastest growing concerns in the business world--the Gartner Group expects more than 50 percent of large organizations to have intranets by 1998 (Martin, 1996).

The ACBSP website was first envisioned as a conventional node on the Internet to be used predominately for external marketing and information dissemination. However, as iterations of the original model evolved, attributes of an intranet unfolded. The website is physically housed in one location, on a particular server, and serves primarily as the accrediting organization's homepage. Yet, the links to member institution and affiliated organization websites contribute to a sense of a organization-wide focus.

In addition to ad hoc announcements and ACBSP literature, links to potentially 200 plus institution/business school Web pages allow for electronic dissemination of research, discipline-level sharing, peer communication about course content and curriculum matters, and even project/publication collaboration. Further, an intranet-like membership database is housed in one location reducing data redundancy and preserving data integrity. This type of service is commonly called virtual website hosting.

Logical/Physical Design

The logical design of a website defines the conceptual relationships among the components of the Web pages and their hyperlinks. In contrast, the physical design is concerned with the actual implementation of the logical design. Logical design entails the organization of material, the user's interface or how one "navigates" the various parts, and how the material is accessed from various locations. The physical design concerns where the content is stored, i.e., on what computers the files reside. In other words, the logical design is concerned with the what, while the physical design is concerned with the how.

Virtual Web Site

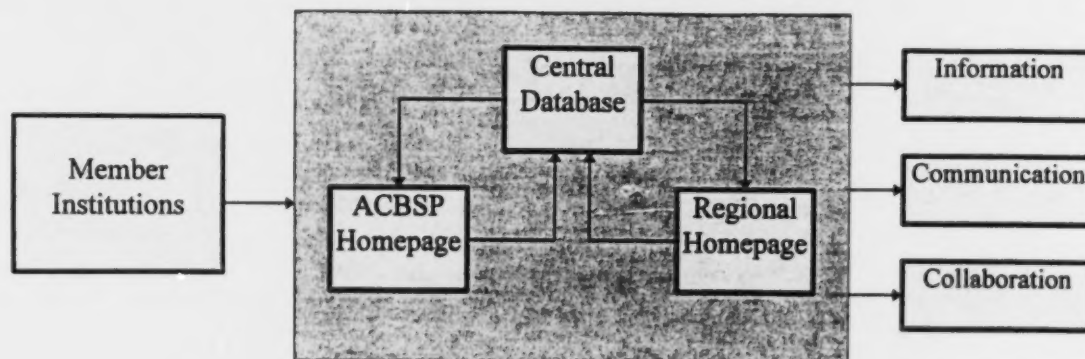


Figure 1

The logical model used for the ACBSP is a hybrid internet website/intranet (Figure 1). The Web pages that reside on the <http://okra.deltast.edu> server appear to a visitor to be the actual ACBSP organization. The website is actually a triad, the three parts being the ACBSP national homepage, the eight regional homepages, and the central database of member institutions.

The ACBSP homepage functions as the organization's hierarchical top level or as a logical main menu of choices. This page branches to various attributes or sub-levels such as the director's welcome, the mission statement, and links to affiliated organizations such as the Institute for Certification of Computer Professionals (ICCP). It contains the logo and has the look and feel of a home base.

The homepage contains a link to a "Regional" main menu which offers links to regional homepages which in turn allow links to member institutions by state. The region pages also offer a branch to an expanded region website. These expanded websites are maintained on different servers located at other institutions which have volunteered to house a regional site.

This distributed file serving environment allows for a higher degree of flexibility. While all of the links within the ACBSP homepage have the same look and feel both visually and navigationally, the designers of the regional pages have been encouraged to "do their own thing." The overall virtual website enjoys the best of both worlds--the consistency of predictable structure within the organization as a whole and more creativity and diversity among the regional membership.

The third aspect of the ACBSP "Intranet" is the central database. Traditionally, two approaches to storing data have been used: the file processing environment and the database environment. On the Web, the file processing environment, where each website has its own

collection of files, is typically seen. This approach is considerably less complex and more easily implemented. However, the twin problems of data redundancy and a lack of data integrity might occur in the file processing environment.

Data redundancy is inefficient as it results in additional storage space requirements. More critically, however, is the potential for data inconsistency. When updates to the data are necessary, all files must be updated universally. For example, if more than one website listed a schedule for an upcoming conference and specific schedule changes occurred, the potential for conflicting information exists. This type of information impacts on data integrity or, simply, lack of quality, reliable information. To ensure data integrity, a single, well-designed database that can be accessed on-line is the best solution. For membership on-line updating, the ACBSP top-level region pages have a link to a form on which users can fill in data fields. When the user activates the "Send Form" button, a CGI program (using UNIX-specific PERL scripting) is run.

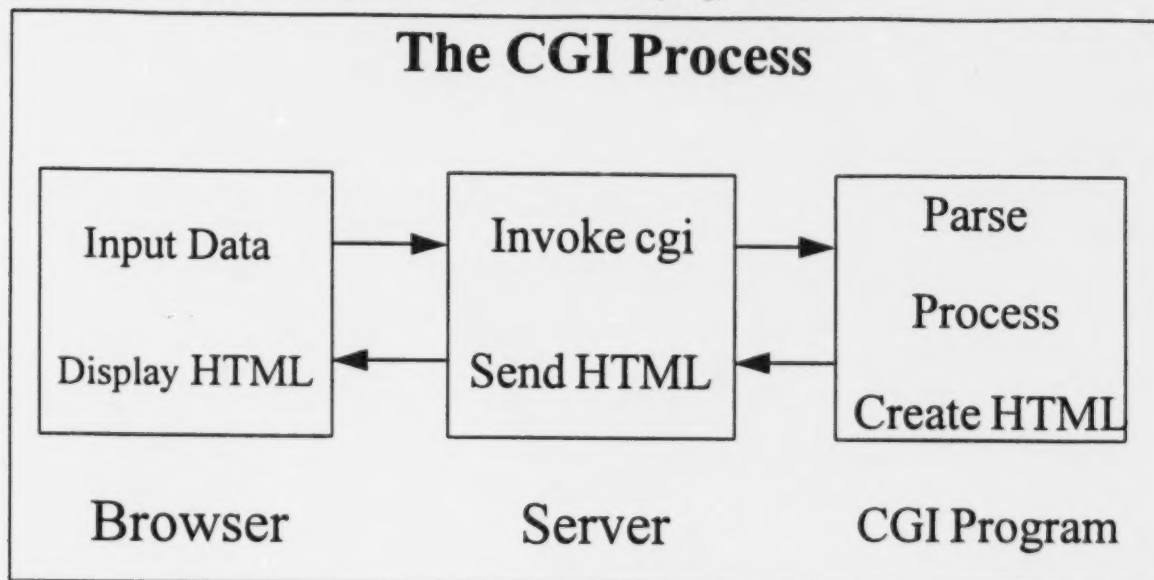


Figure 2

Common Gateway Interface

The Common Gateway Interface (CGI) is client/server standard for setting up simple communications between a Web browser and server. CGI makes it possible for a browser user to initiate and pass information to server-based programs. In addition, users can receive information back in the form of a dynamically created Web page. CGI programs make it possible to implement Web-based applications with a minimum of expense. The CGI standard is supported by virtually every Web server and browser, making it possible to bring platform-independent interactive applications to just about anyone with a Web browser.

When an individual completes the form to update the ACBSP member lists and activates the "Send Form" button, the data is passed to a server-based CGI program as a parameter list. The CGI program then performs three tasks: (1) parse the parameter list to separate the data into fields, (2) process the information accordingly, and (3) provide feedback to the user (See Figure 2). The CGI program dynamically creates an HTML page containing a message stating that the request has been

processed successfully. The HTML page is then written to standard output and transmitted to the user's browser.

After CGI processing, data is written to a flat file on the server. Another program appends the data fields to an Access database by way of Open Database Connectivity (ODBC). The Access database in turn has a program module that outputs HTML files which reflect the updated membership information. This Access program runs an FTP script which uploads the updated HTML documents to the server. Therefore, the entire update process is automated.

What We Learned

The Internet is a communications medium like any other, it's just somewhat more sophisticated. Developing a website for a national organization with a distributed membership is both technically and administratively complex. Technically, such details as the CGI programming and connectivity between the UNIX server and the PC-based database, although straightforward, require considerable expertise. Administratively, several issues require strategic planning and not a little diplomacy.

Communications between the technically-oriented development team (who are volunteer labor) and the organization's decision-makers (who are Internet novices) can be challenging. When trying to coordinate the input of many players, "turf" is a sensitive political issue. A big question for this project concerned deciding who would develop each of the eight regional websites--whether it would be decided on a first-come, first-serve basis or authorization would come through administrative channels.

An initial consideration concerned the number of people to involve in the project. Realizing that a complex project would occasionally be taxing on normal schedules and the fact that long-term maintenance would be involved, the decision was made to recruit several members so no one person would be overwhelmed. The website development team was comprised of four members who brought a diversity of skills and a wide range of experience to the project. The various roles were shared among the group, e.g., providing leadership in strategic planning and acting as spokesman; outlining agenda, scheduling meetings and tracking milestones; designing database tables and the hyperlink logic; programming using hypertext markup language and CGI scripting.

The ACBSP website remains, as do many locations on the World Wide Web, "under construction." The long range plan calls for the website to be ported to a server that is administered directly by ACBSP staff. It is hoped that the organization is well served by this model that is essentially reliable and flexible enough to be adapted to changing needs.

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Small College AI

Harold H. Kollmeier
Associate Professor
Computer Science and Information Technology
Franklin Pierce College
Rindge, NH 03461
phone: (603) 899-4254
fax: (603) 899-6448
kollmeier@rindge.fpc.edu

An ideal AI environment

When I was in graduate school, I learned in an environment devoted to the advancement of artificial intelligence. I worked with people who had the minds and the dedication to their specialties, along with an advanced level of equipment, to move toward making significant contributions to their field. Those of us who were focussed on computational linguistics had our own lab, which had equipment that was dedicated to our pursuit. That lab had a combination lock, and all of the CL research people had the combination. There were no hours of availability to the specialized equipment - it was open for our use at all hours. Indeed, some of my work from those days, still in my files, is time stamped 4 am. There seemed to be no end of commitment to the pursuit of specialized knowledge. And we were not isolated. All of the most important people in the field, from John McCarthy on, came through at some point during my graduate years, giving talks and attending seminars. In addition, the faculty were successful and capable in their specialized fields, and the students persevered with the expectation that they were carving future career paths for themselves.

A real AI environment

I now teach at a small, liberal arts college, where it has been my task, among other tasks, to develop the computer science program. I teach many different computer science courses, many of them advanced. I cannot limit myself to artificial intelligence, much less computational linguistics. I can't even limit myself to computer science, for I have taught our core course in the Twentieth Century. We face ongoing budget constraints, which affect computer science; and it is simply unfeasible that our equipment be designed to support arcane artificial intelligence specialties. And our students, while interested and reasonably hardworking, are mostly not headed for graduate school and specialized knowledge. Finally, as a small, liberal arts college, we do not partake of the research institution circuit.

But as a liberal arts college we remain a legitimate site for Computer Science study, as is verified by the existence of guidelines for such programs set out in "A Revised Model Curriculum for a Liberal Arts Degree in Computer Science" set out by the ACM (Communications of the ACM, Vol. 39, No. 12, December, 1996), which reminds us of our special place: "A liberal arts education strives to maintain balance between a breadth of study in a variety of fields and a deeper understanding of a major subject area."

So - what is the task?

What, then, is the feasibility of maintaining a reasonably sophisticated course or set of courses in artificial intelligence? Can it be done? Should it be done? I think the answer to these questions is yes, because I have found that the subject matter does connect with the goals of my small college students in perhaps surprising ways, and because I have found that the technical problems are surmountable. Let me address this issue by isolating the different parts of the problem, as I have suggested them above. I will discuss the problems of isolation, student ability, motivation, and expectation, equipment, and, finally, faculty readiness. I pull isolation to the forefront because this allows me to bring up three issues that will provide focus to the discussion - the choice of the text book, the resources of the Internet, and the use of the library.

Combating isolation: the textbook

There has been an interesting though incomplete jelling of opinion recently, it seems, about how AI is to proceed, which is in the direction of what is called the intelligent agent. This has as a symptom the wide adoption of one text, Stuart Russell and Peter Norvig's *Artificial Intelligence: A Modern Approach* (Prentice-Hall, 1995). According to information provided by the publisher, 35 of the top 40 computer science programs in the nation use this text. This adoption rate occurs in a field of a number of competing, very fine texts, some of them with long histories of use. So, on the one hand, the text gives us a community within which to work: the community, that is, of those who have adopted the text and who therefore, presumably, subscribe to its point of view. But there is another interesting way in which the book combats isolation.

While the book indicates widespread consensus, the issues here are still up for grabs. As the authors define "intelligent agent" in the preface "the problem of AI is to describe and build agents that receive percepts from the environment and perform actions." (Russell and Norvig, p. vii) A percept can be defined as the list of stimuli, or perceptions, for the environment that the agent stores, derives further information from, and acts upon. Not everyone agrees with this. Marvin Minsky, for one, has raised some doubts about "intelligent agents" in two separate interviews, one presented in *Communications of the ACM* (Vol. 37, No. 7, July 1994), and the other in *Hal's Legacy: 2001's Computer as Dream and Reality* (MIT Press, 1997), because they do not correspond to his notions of intelligence and general problem solving.

But I should not digress too far into this AI controversy. The point to be made for the present discussion is that the definition of the field is an ongoing pursuit, and a course in AI should be taught with a sense of that incompleteness. Part of the excitement I have been able to generate comes from this sense of unsettled matter, which people out there, as well as ourselves, are taking an active role in shaping. The Russell and Norvig texts helps contribute to this sense.

Combating isolation: the Internet

Being part of a community, feeling that we are not just taking/giving a course off on campus somewhere, is further enhanced by Internet access. This takes two forms. The first is the support provided in connection to the Russell and Norvig text.

Some of the things we have come to expect as support for a text is available at the text Web site, including, for example, the usual figures for use as transparencies. The text generates news, which we hear about, include the fact that it has been translated into Spanish, with translations into Japanese, Italian, and Chinese in the works. The support becomes more interesting through access to the syllabi of many of the courses taught around the world, which either the instructor or a teaching assistant has chosen to make public. This is truly valuable to the instructor, as a mine of ideas, and as a source of creating balance - the instructor's syllabus gets constructed in the context of many other syllabi out there. The students have found these "alternate" syllabi to be of interest. They have friends at these other schools, and they now share a new level of information.

The text home page also is being used as a clearing house for related information. A report on the developments concerning Deep Blue, for example, is clickable. There is even a set of course notes from someone from the University of Michigan. Perhaps the most valuable material at the site is the repository of code for the problems in the text, provided in Lisp, C++, Prolog, and (it is promised at this writing) Java. We have had source code for some time coming in various ways with texts; but I find that its presence at a central location, which is reachable by the global Internet audience, to be symbolically valuable.

My sense is that this is only the beginning of what could take place along the lines of course support. The materials need to be more dynamic and interactive. There have been flurries of group discussion among instructors, spurred on by the authors, most recently over the issue of the appropriateness for AI of the various programming languages. This kind of interactive discussion could take place among students from various institutions, sharing at the same time, for example, a specific programming assignment. There could also be some kind of tapping into research developments.

Combating isolation: the Library

My experience in the past with sending students off to the library for "research" has usually been pretty dismal. Students do not do research in traditional ways, and this is particularly true of computer science students. It seems that they do not regard the library as having a valid connection to the rest of their interests.

I have had some success in the AI course with this problem, by linking the library - especially the books I put on reserve - with the electronic experiences described above. By creating a sense of community with the world of research in AI, by treating the field as an unsolved problem, and then by talking about particular texts - Marvin Minsky's *Society of Mind* (Simon & Schuster, 1985), for example, or the new and compelling *Hal's Legacy: 2001's Computer as Dream and Reality*, mentioned above, or the Paul Graham text on *ANSI Common Lisp* (Prentice Hall, 1996), which the students have used but did not buy for the course, but is indeed on reserve in the library, I have generated a rise in the use of reserve materials.

It has helped, of course, that these works have the special verification of being referenced in various places on the World Wide Web. How deeply students use these materials I do not wish to investigate here, for I do think that is too much to ask at this stage in my development of these strategies. But they are exposing themselves to the material more than they have in the past because

they sense that the materials are an aspect of the unsolved problem, the incomplete adventure, of which they are a part.

Student ability, motivation, and expectation

Every year our computer science program, which is only five years old, gets a bit more serious and a bit more crowded with majors. We have responded to this by getting a bit tougher each year. But we still are not dealing with a group of majors who want to go off to graduate school in computer science, nor should we expect to. Traditionally our students go off to family businesses and to small companies. We might expect, therefore, that Artificial Intelligence is outside the realm of their concerns. But this is not the case, for several reasons, having to do both with their perceptions and with the way the course can be pitched to them. First of all, the problems and resulting algorithms and implementation in AI can be seen as an extension of traditional data processing. Many modules in AI systems employ rather obvious, although rigorous, programs, and these can be taught as an extension of what students already know. For example, a survey of AI text and syllabi reveals that search is an obligatory subject matter in the AI course, usually put early in the semester. Well, CS students have already been introduced to search as a topic in programming courses, and search in AI can be taught as an extension of that knowledge. Learning AI topics, therefore, can be seen as enhancing general computer science knowledge.

It is also true that the AI course becomes more legitimate to our students if the applications investigated are extensions of computing problems students already know. Futuristic visions of C3PO-level capability are fun for a while, but our students would like to see something more immediately workable and valuable. And of course this is possible, because there is a rich world of AI-implementation that can be observed. A good example is the issue of natural language interfaces for data bases. Most students have been through the data base management systems course, and have worked with structured query languages. They therefore can see the value of being able to query a data base with natural language utterances; they see how this would enhance the use of the database and extend the user population. The stage is therefore set for a deep-level investigation into problems of computational linguistics, including problems of pragmatics and knowledge representation.

In addition to these "concessions" made because of the perceived student body, it is important not to overlook the potential graduate students who are, indeed, in the crowd. With this small group of students the motivation should be built in, because artificial intelligence is one of the major areas that excites the imaginations of the masters student and the potential PhD. A corollary to the implications of the presence of this small group is the fact that students are often motivated simply by the intellectual content of the subject. Many of the students simply like the course, and do not worry about where it fits in.

"The Revised Model Curriculum for a Liberal Arts Degree in Computer Science" mentioned above notes that AI is "typically viewed by students" as one of the "fun courses," and this source of motivation, valid for all students, has particular application to small college liberal arts students, who are encouraged to think about their place, and their major's place, in the world. I tend to think of our technologically oriented CS majors as removed from the mainstream concerns of the other students majoring in mass communications, English, etc., but occasionally I get a surprise. When we started

the computational linguistics component of the AI course this past semester, for example, I had everyone make use of some text-generating Lisp code available over the Internet. The code picks up a base text provided by the user, creates a "knowledge base" of words and some structures, and then generates a new list of words based on grouping from the original, some randomness, etc. The assignment was to pick up a text from the Internet, Edgar Allen Poe's *Raven*, for example, and to create a new "poem" from the original. Analysis of what the code is doing was included in the assignment, along with some speculations about what the code was not doing, in terms of syntax, context, understanding, etc. I thought this would get us off the ground with the issues of language, but I was a bit concerned that the subject matter of the assignment was a bit too "literary" for the CS majors. This turned out to be an unnecessary worry. They all found it to be quite provocative; indeed, some of the CS majors turned out to be back-burner poets, and they used their own poems as the original texts.

In various ways, therefore, the small college student body does not constitute an insurmountable problem for the development of artificial intelligence as a course subject matter.

The Equipment Crisis

At Franklin Pierce we have mainly a DOS/Windows environment. Three labs have Pentium-based PCs linked by Novell NetWare, which provides support to the Internet via a local non-profit provider. These open labs are used by anyone on campus, and in most cases the activity on the machines consists of games and word processing. We also have one Mac lab, used mostly by the graphic arts people. Our Unix environment is limited. We certainly have no equipment or labs devoted to research in artificial intelligence.

However, while this environment must be judged as limited by research institution standards, and while its limitations do prevent delving into the more sophisticated areas of AI activity, it does provide a workable environment for most introductory projects. Search, reasoning, logic, computational linguistics, and some vision work are all possible with a simple Lisp. Computational linguistics projects, for example, while not as glamorous as those I remember from graduate school, can involve meaningful work with parsers and some implementation of semantic and pragmatic analysis. I use Allegro Lisp, which is a freeware download from the Franz Inc. site.

Where we fall short most seriously is in computer vision. We do not have the capability of accessing the bit configurations of individual pixels, much less anything more advanced. But I have developed a small, makeshift project in edge detection that allows us to get a feel for that "primal sketch" processing.

For an actual image, whose individual pixels we would access and manipulate, I substitute a simple text file, using 0 to 9 as a substitute for the pixel values. Students access this text file as a two-dimensional array, and they then proceed to do a neighborhood analysis to produce edges. This is a bit hokey, but it works.

Interestingly enough, students do not see any shortcoming here, and they find the exercise to be quite stimulating. I explain the limits of what we will be doing, and I paint a picture of the larger world of "real" vision processing, but the response I receive is that I am bringing up an

unnecessary issue. Most students understand the appropriateness of model building and working in scaled-down environments, more than I expected, it seems.

Faculty time and preparedness

It should be clear that I regard small college AI as a worthy enterprise, and that I regard most shortcomings as surmountable. However, I cannot be as optimistic in the area of time and general atmosphere for faculty to do this. Not that we don't work hard, and are not committed. But small colleges do not provide the time for the development of expertise that is necessary to do an outstanding job in the more advanced fields. The load of courses, core curriculum obligations, advising, committees, general college activities, works against expertise in specialized fields. I suspect that this might be especially true in technology, where demands are very great, and where the terrain keeps shifting. And I hope I have suggested here that the limits placed on this subject matter demand even more creativity, in finding ways to master the hurdles.

Of the various challenges associated with small college AI, the path is least clear here. Part of the answer is a unilateral commitment to the subject matter, devoid of the resources and awards that might normally accrue. Part of the answer also lies in a stronger campaign to persuade the college administration of the importance of what we do.

The Emerging Trends in Application Integration

David K. Moldoff
Applied Business Technologies
4631 West Chester Pike
Newton Square, PA 19073
dmoldoff@email.abtcampus.com

Introduction

Information Technology is Advancing Constantly

Everyone sees and feels the symptoms of revolutionary changes as innovation after innovation is introduced, and administrators and managers have been forced to adapt the way they perform tasks. During the past 50 years, for example, we have gone from wires, diodes and punched cards to mainframes, mini computers, on-line terminals, networks, and PC's.

Every administrative process can be divided into events or steps and, each step can generate multiple messages that reflect the status of the transaction or event. Messages can have standard actions performed before, upon receipt, at completion or upon deletion. Until now, users had three more or less expensive options for acquiring systems to perform these steps:

Home grown systems;

Purchasing stand-alone (Component) systems;

Purchasing integrated (Legacy) systems.

Today, we are still adapting to E-Mail; networking, Internet, and Microsoft Windows as standards are evolving for desktop operating systems, Local Area Networks, and Corporate IntraNets. Web standards and the communication media (i.e. Internet) will shape the landscape for information system technology and office automation in the 21st century.

The purpose of this paper is to project present trends in application development into the next decades. How can application software developers reduce the cost of their software commensurate with the cost of computer and communication hardware? How can software be made more adaptable to unique user needs?

Forthcoming Innovations

The revolution in Information Technology has reduced the cost of computer hardware as well as communications. The growth of complexity and cost of application software have accompanied user expectations encouraged by the increasing power.

The inevitable next steps must include software cost reduction by means of:

Greater modularization, standardization, and interchangeability of hardware and software components and interfaces.

Development of standard message structures to request and transmit data packets between local and remote components.

Networks will consist of three kinds of specialized components: Clients, Servers, and Processors. To accomplish a typical unit of work, a Client might send a message to a Server requesting that the Server perform sub-tasks (such as store, replace, transmit, delete, etc. transaction data). The Servers might, in order to complete its sub-task, send a message to a Processor to perform an operation (such as sorting a file). When the requested action has been completed, the Server will respond with the results.

Standardization and Interchangeability

Standardization of component interfaces and message structures will have the following benefits:

Facilitate mixing and matching of "Best-of-Breed" components;

Reduce the need for human interaction to perform a task;

Reduce the cost of modifications and enhancements.

Acceptance of Client/Server technology requires the migration of 'code' into small interchangeable packets that support the standard message architecture pioneered by the Web and Internet. The rocket-like acceptance of JAVA, Sun Microsystem's new hybrid language, is supporting this component concept called applets.

Future systems will consist of 'Best-of-Breed' application software components, replacing the "one size fits all" Legacy system, built to serve a large family of functions set within an organization. Legacy systems had a primary benefit of cost sharing, at the price of slow response to the need for change. They also lack the function-rich features of component software developed under Windows, the Web, and the workflow model supported by messaging. New software components, designed with the 'Best-of-Breed' approach with messaging will dissolve the Legacy software system piece by piece by replicating the current functions and supporting a friendlier user interface making productivity more important than cost and centralization.

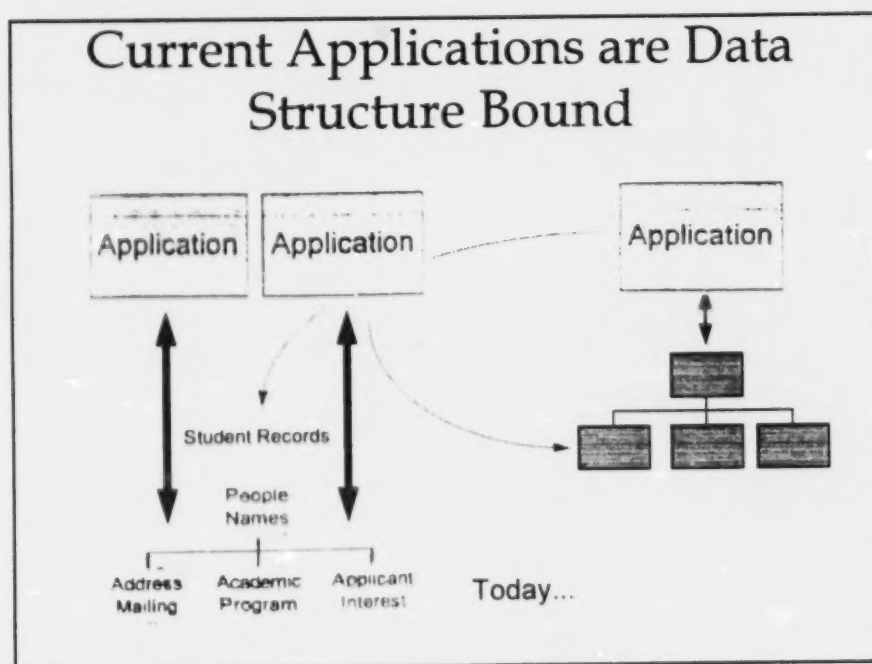
Cost, functionality, and flexibility justify migration to component-based systems. The next phase is for industry groups to define transaction formats to support Electronic Data Interchange (EDI) using electronic commerce as the justification to define the events that support messaging between and within Application Systems from point to point. The next step will be to design and construct communication components. Once communications have been established, there will be a surge of application development.

The Problem: Legacy Systems are Data Structure bound complex and Centralized.

In Legacy systems, most application modules are linked by shared data structures. Sharing data structures is not necessarily complex. Complexity derives from the number of applications, the number of data files and the interface functions needed to perform workflow procedures.

Inherited data structures create obstacles to enhancements and new applications that require data that are not accommodated in the existing structure. Two options are in order: (1) add new files, or (2) modify the existing files, with ripples throughout application designs. Both options add redundancy and increase the cost of operations as application components are implemented from different software developers.

A typical Legacy system may have hundreds of data files, which accommodate the need for many interfaces. Complexity is added when a shared data file is altered, impacting other application modules sharing access to the changed data file. The cost to accommodate changes in this model is high due to hard coded dependencies.



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The Solution

What is required is an environment in which systems consisting of 'Best-of-Breed' components, both hardware and software can be assembled using off-the-shelf proprietary modules. Interfaces between components must be integrated so that they appear seamless to users and managers.

To ensure the participation of all interested parties, including institutions and vendors, consortiums such as the Midwestern Higher Education Commission (MHEC) must assume part of the leadership in setting and achieving goals such as:

**Atomizing Application Software,
Standardizing Component Interfaces, and
Developing Rules for Peer-to-Peer Application Messaging.**

The criteria for the solution will be the ease with which it accommodates innovation and change, its inclusiveness, and its flexibility.

Application Software Atomization

Every application program can be partitioned into single-instruction atoms independent of the language or source of the program provided the installation includes translation tables. Each instruction message therefor needs, at the minimum, to identify:

addressee of the instruction,

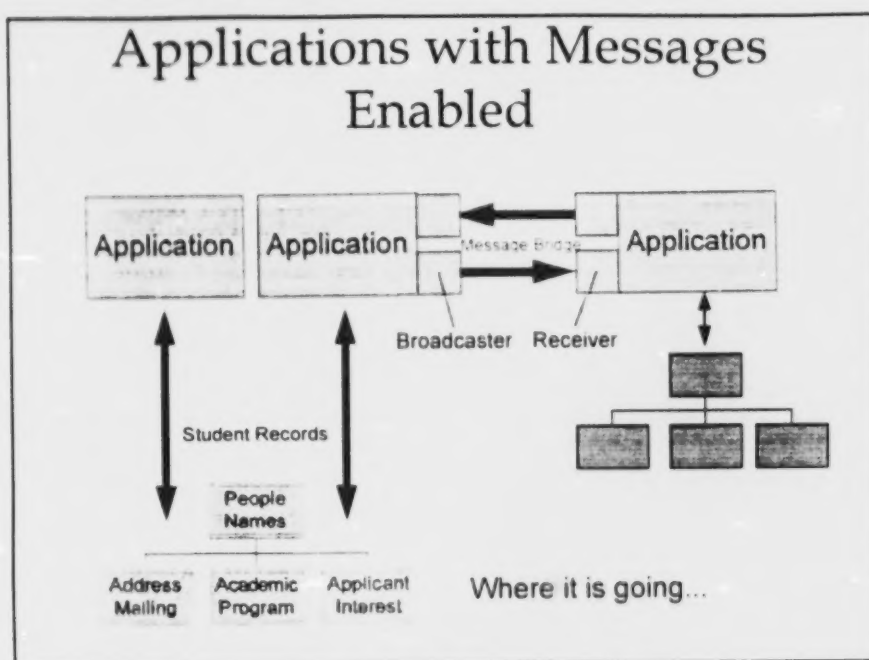
the generic instruction,

applicable identifiers,

operand source,

execution time, and

Disposition of results.



Who Will Set the Standards?

Legacy systems have implied standards set by the designers. Individual application components may even have internal standards, but they are all different.

For messaging to provide the bridging between independently developed applications, they must adhere to standards for:

Addressing and Protocol;

Message structure and language, and

Functional instructions.

When Thomas Edison invented the electric light bulb, he had to confront the need to distribute electric power. He chose a direct current option, but soon had to switch to alternating current because of lack of DC power transmission components. Much of Edison's investment in generating and distribution plant assets went down the tubes.

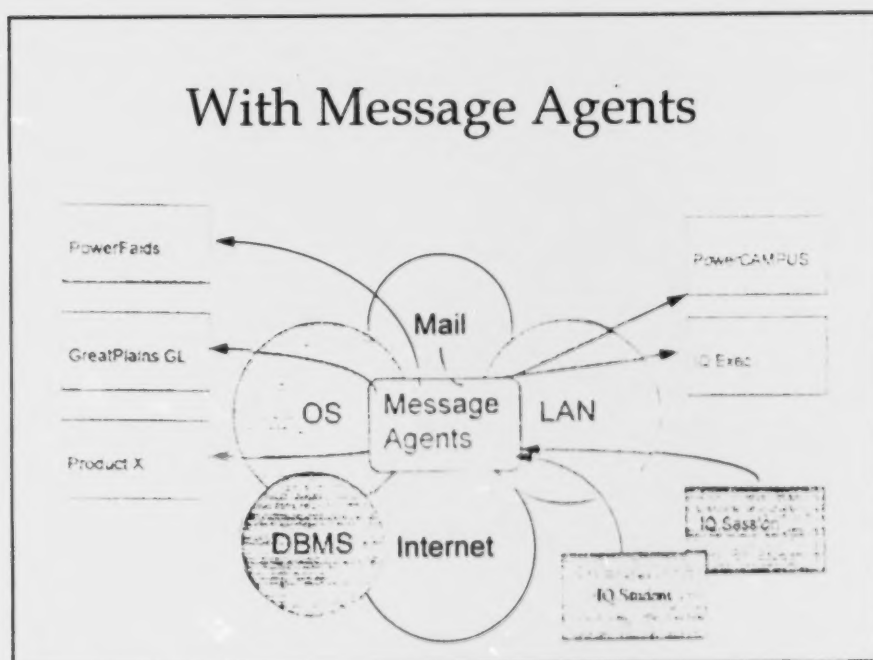
The challenge is different today. The information superhighway and its standards already exist. Transmission hardware and software are available. Lacking is the ability of application components to generate and interpret instructions and data comprehensible to disparate systems. The situation is analogous to a light bulbs made by various vendors that have different kinds of sockets and use different voltages and frequencies.

Industry Must Define Messaging Standards

Just as the industry is developing standards for reporting, it must develop standards for inter-application messaging to lower operational and acquisition costs. The longer standards are delayed, the greater will be the cost of implementation and integration of custom-built applications.

Both developers and users of application software can be expected to agitate in favor of their own prototypes. Something like the FASB (Financial Accounting Standards Board) is needed to mediate and resolve the issues and define message standards.

This standard setting agency should have representatives of all of the interested parties lest it become captive of some dominating interest.



Technology - Peer to Peer Messaging Solves:

The Bottleneck Problem and Creates a More Versatile Software Platform.

Each message is transmitted in a packet envelope which contains control data, such as source & destination identifiers, dates, transaction type & status, priority, selection criteria, security level, etc., and the messages, when saved, constitute an audit trail.

Network messages are deemed to be local, Intranet, or wide area. Messages can be described to be primary, secondary or dependent. And messages can be secured public or restricted. Messages need receivers (special programs in themselves) that can handle the methods, actions and behaviors designed into the message. This would allow application component products to be developed and deployed independent of their author and platform.

Instead of reading and writing into data files, applications transmit and receive electronic messages in standard event formats. Each Server listens in on the network for messages with its address, and captures those with the appropriate identifiers. (All other messages are ignored.) The Server places its messages in a queue and executes them in priority sequence.

Upon execution of the message, a message is returned conveying the results. The network medium is extremely fast, and the transmission delay is infinitesimal.

Messaging System Models

Electronic communications has undergone several revolutions since Morse code was invented. The development of the Web and Internet that is fueling radical changes in the computer industry are in the tradition of Bell's telephone, Marconi's wireless, Babbage's computer, and Sarnoff's TV. Key attributes that fuel the Web opportunity are:

The simplicity of the user interface;

The message driven model supporting the transmission of 'requests' and 'answers' from server to client;

The standard format of HTML documents;

The portability of the applications;

The ease of developing Web sites;

The links from Web site to Web site promoting cooperation and openness;

The graphics and text support making the products sizzle, and

The free form formats that combines structure with flexibility.

As the Web and Internet expand, the application model of computing is under pressure to adapt and facilitate electronic commerce via the open Web interface. Organizations worldwide are building their Web presence by altering business practices to include Web services. Microsoft and Netscape are battling for presence on the Web and control the tools that support the Web and integrate with the operating systems on the desktop and on the server.

Just as the Web was fueled by the above attributes, the platforms for business applications that run and administer businesses are under pressure to adopt the new model of information management. The evolution of computing has been altered by market acceptance of desktop innovations, cost savings in the use of purchased tools rather than in-house developments, and increases in access to information for a wider audience of users. These movements in the industry have been brought on by:

the migration from centralized computing to decentralized support for users performing the work;

decentralized functions on desktop computers that replace old ways of doing things, and

Integration of office tools on the desktop serving the productivity of users.

Application development lead-time and cost are major reasons for the market to encourage the trend toward the new model of computing. A Web message driven structure will reduce demands on centralized, complex Legacy systems.

Inter-Application Traffic

The same inducements for open systems between entities apply within administrative departments of each institution, and the market is shifting to components or object development based upon Microsoft's component object technology called OLE (Object Linking and Embedding). The concept seems complex, but is quite simple in reality. Build functions called 'clients' and 'servers' that mirror the application actions we perform as users. A 'client' requests data or services from a range of 'server' functions. These requests are enveloped in 'messages' that are transported between 'clients' and 'servers'. Windows is already based upon this technology and so is the Web. Most PC application software today must offer the same functionality.

A user fills the blanks in a screen form and accepts by using the OK button. Data are validated and sent to the database where they are processed. If an error occurs, a 'message' is returned to the function and displayed for the user in a box window giving instructions on what to do next. If the data are OK and accepted, the transaction is accepted and other functions are triggered, if necessary, to update other database tables.

The user filling in the screen form is in a sense using an object to perform a function. Today, the function resides in large central systems and called from menus. These functions are developed with instructions in Fourth Generation toolsets like Oracle, SQL Windows, PowerBuilder, or Delphi or legacy code like Cobol or Basic. The functions execute as 'fat clients' doing all the work or execute on a multi-user platform.

When functions are exported to standalone forms in the client/server model, they can be called at any point within the framework of the desktop OS. This way, functions can be seamless with the OS and interact with E-mail and the other supporting Office tools. This is one of the main thrusts of client/server and it enables the developer to distribute the workload between server and client desktop.

Most existing application software does not follow the approach described above since their designs rest on a foundation of data structures and complex logic performing the functions centralized in code developed over many years on UNIX or mainframe systems.

Legacy systems have evolved into complex, expensive and cumbersome platforms. They can be large bottlenecks to adopting procedural improvements. If we break down the complexity of a Legacy system by managing the events rather than the database transaction, we can reduce the costs of development of new functions and their deployment and at the same time it will give users new flexibility, control and productivity managing their work responsibilities.

The Transition

The transition to open systems has barely begun with use of E-Mail and Windows. Atomizing application software into component objects or little black boxes that perform single functions distributed over a network and shared by many users is the opportunity of the future. This trend has started with the acceptance of Windows as the standard desktop OS. ABT expects a major shift in application deployment to result in component objects as Legacy systems continue to lose footings in peripheral functions they perform poorly. In the next five to ten years, many organizations will adopt this system orientation because of their exposure to Windows on the desktop. Over time, a team of component products will replace their large, complex, centralized view of data processing being delivered in Legacy software.

The Agenda for Software Developers

A new model for computing will evolve because

The industry will be freed of software design restraints of record and table structures called relational database models. Organizations are building and implementing data warehouses to foster the integrated view of data while separating the operational layer from the data model. This will reduce the likelihood that one vendor or one product will support all operational functions.

Users will demand greater flexibility, simplicity, and satisfaction of their needs and expectations.

Institutions will demand faster response to their needs for changes at lower cost.

Data warehousing, messaging, and software atomization will facilitate modification and enhancement of application software.

Object oriented development, already used by Borland and Microsoft; will free code intensive applications from structural paralysis.

Messaging via the Web and Internet will liberate users from the constraints of geography and system structure. For example, student registration represents a sale to a student. The event consists of a course request, debiting the course offering, crediting the course-section list, and retaining the transaction as an audit trail. The process requires user based forms for on-screen interaction and message-based functions that send and receive data from the server holding the database structure. The Web has led the way in popularizing a new method to address how applications can be designed piece by piece offering a much more flexible solution for application development.

In the new scheme, non technical decision-making managers and administrators become users with the same ability to submit inquiries and receive pre-programmed responses without encountering delays inherent in acquiring formal reports through the chain of command.

The new environment encourages competition on the basis of quality and responsiveness. Institutions have the option to assemble networks of 'Best-of-Breed' components since no vendor (not even IBM or ATT) has all the resources to develop all the functions needed in the real world to satisfy every user in every organization. Expectations will continue to march forward and change and is the only action that can be predicted.

File/record imports and exports from function to function today support product integration. For example, when a prospect changes status to an applicant, a record is moved to a new structure. Or, when Cash Receipts are entered, the student's balance must be posted. The terms batch or posting is often used to describe a computer process that ties two or more functional areas together. This type of process adds extra steps to procedures and complexity. Moving to a dynamic message process to update across components, the real time updates would eliminate the need for these steps.

Criteria for Success

The union of high-speed data packet technology has opened the window of opportunity for system integration by means of messaging between applications on the desktop and server. This has made the linking between applications a common expectation never dreamed of a few years back. Those who seize the opportunity to advance messaging between peer components will be forging the next generation of administrative systems.

Those who bring out the 'Best-of-Breed' solutions will win the race. These will be selected by astute educational institutions to assemble the effective networks of application software. As component products are built and employed, users will be able to employ suites of components to satisfy their functional needs and supplement many functions lacking or limited by design of older Legacy systems.

'Best-of-Breed' components are defined as those that are user-friendly, that are easy to implement, operate, support, and maintain; that have the functionality demanded by the users; and that perform effectively in networks with applications built by competitive vendors.

As organizations begin to adapt and work with EDI (Electronic Data Interchange) based applications; there will be a pull to adopt standard operating software supporting a message driven model independent of the database. This will provide a whole new level of computing. It will eliminate the application barriers present in large complex databases by breaking down the complex work process. Providing in essence, a component that does the work in a black box and delivering service or a solution in the message sent to a user. This may be in the form of a report, message box on the window or an e-mail message reminding a user to do something.

These developments will promote a new approach for administrative systems for colleges and universities and will force market consolidation. Vendors who continue to develop and support integrated administrative systems will need to cope with growing expectations of their installed base of clients and attempting to serve a continuously changing prospect pool who aspire to adopt new technologies rather than established products based on obsolete technology.

Many organizations have a great deal invested in present Legacy systems designed to maintain the organizations' data processing functions. The infrastructure of the Legacy systems is complex and expensive. Moving from Legacy systems to networks of application Components requires a significant investment in money and energy. Risk and stress are the price of advancing from one level of technology to the next; so many institutions are loath to replace their Legacy systems.

Program-to-Program Articulation for the World Wide Web

Charles H. Morton, M.Ed.
Coordinator of Articulation
University of South Carolina-Spartanburg
University Center of Greenville
P.O. Box 5616
Greenville, SC 29606
morton-chuck@sc.edu

and
Stuart Shough, M.A., C.P.A.
Faculty, School of Business Administration and Economics
University of South Carolina-Spartanburg
800 University Way
Spartanburg, SC 29303

Introduction – Articulation and Dissemination of Information

The mission of The University of South Carolina-Spartanburg (USCS) is grounded in the belief that it is a metropolitan university. Being a metropolitan university means USCS accepts its role as providing higher education and service to the community known as the Upstate of South Carolina. As part of this metropolitan mission, USCS embarked upon a new trek to make transfer of course work from two-year, associate degree granting institutions, into baccalaureate degrees. What started off as a small effort in the Fall semester of 1995 with two local technical colleges, has blossomed into a relationship that includes four associate degree granting institutions and over 120 program-to-program articulation agreements.

Initially, the agreements were created with a word processor program and duplicated as needed. With the vast amount of information being manipulated, it was soon discovered that a database would be the best method of data management. Microsoft Access[®] was chosen as the database engine and soon all data for the articulation agreements was entered.

For these articulation agreements to be fully utilized there had to be some way for students to easily access the data. Various methods were considered and tried, but none were more cost effective than placing them on the World Wide Web (WWW). Once this was decided, an efficient way had to be used to translate the data from a Microsoft Access[®] format into Hypertext Markup Language (HTML) to enable potential students to view the data from a "web browser".

Selection of the HTML Translation Tool

Rather than trying to learn the intricacies of HTML, the developers scanned the WWW in search of a no-cost solution to translating the Microsoft Access[®] database reports into HTML. It was

discovered that Microsoft had developed such a tool as a free add-on to the Access[®] database. This tool, called internet assistant, worked remarkably well in translating the reports into HTML pages, but it lacked in formatting flexibility. The filter which translated the reports into HTML lacked many of the HTML tags necessary to incorporate simple functions such as "mailto" and incorporate graphics files. Reports which were translated into HTML were translated line by line as individual tables. This proved to be a formatting nightmare. But it did translate the data into and HTML format and provided a quick and easy way to place information on the WWW.

Selecting an HTML Editing Tool

Basically Microsoft Internet Assistant[®] is just that – an assistant. It assists in the process of moving data from a standard database format to HTML. Once the developers reached this point, a search was conducted to look for another no-cost tool to assist in "beautifying" the newly created HTML documents.

An acceptable "no-cost" tool was located at the following WWW address: <http://www.aolpress.com/press/1.2features.html>. The HTML editor is called AOLpress[®]. AOLpress[®] allowed the developers to incorporate "mailto" functions and dress-up attributes like background images and graphics files.

All of these functions, as well as page linking, are literally a button click away. You can even download and edit the HTML you are browsing which makes editing pages currently on the web a snap. There is one limitation which is not uncommon to HTML editors – one cannot upload pages to the server from AOLpress[®] after the pages have been edited.

The Finished Product

Once the HTML pages were completed files were then e-mailed to the USCS Webmaster for publication to the USCS Webserver. The Webmaster created all of the correct directories for various files and verified that page links worked correctly. As one can see, the pages work and are downloadable and printable from anywhere in the world (for sample pages see exhibits a, b, and c).

Navigation of the "2+2" Web Pages

One may view the project by entering the following web address: <http://www.uscs.edu/academics/two+two/>. This address takes the potential "2+2" student (for our purposes we will call him the viewer) to the USCS "2+2" index page (Exhibit B). Once the viewer accesses the index page he must make a choice from one of four colleges listed on the page (for our purposes this will be Spartanburg Methodist College [SMC]). He will then guide the mouse pointer to the link labeled "Spartanburg Methodist College" and click the left mouse button. This takes the student to the SMC index page (Exhibit C). The student then selects a major area of study and guides the mouse pointer to it. Upon clicking the link to the selected major, the "2+2" document (Exhibit A) is retrieved and the student may download or print the document for future reference.

Conclusion

There are many uses of the Internet/World Wide Web. This project represents one useful method of being productive in a low/no cost way to attract students to programs and services offered by

colleges and universities. The beauty of this project is that one need not be a "webmeister" to develop and post pages to the World Wide Web. Through the use of readily available software on the "Web", those with little, or no, experience with web publishing can be up and running with personal projects in no time.

Exhibits:

Exhibit A

USCS/Spartanburg Methodist College Communications "2+2" Agreement

USCS Major	USC-Spartanburg		3/19/97	
Communi cation	College of Arts and Sciences		SMC Associate	
USCS Catalog: 1996	Spartanburg Methodist College		Degree Program: Arts	
		"2+2" Program Sheet		
		Appendix A		
General Education Requirements			Major Requirements	
		SMC Courses		SMC Courses
Group 1 Communications			Required Courses of All Majors	
SEGL 101 3 hrs.		ENGL 101	SSPH 301 3 hrs.	
SEGL 102 3 hrs.		ENGL 102	SSPH 340 3 hrs.	
SSPH 201 3 hrs.		SPCH 201	SJOU 301 3 hrs.	
Group 2 Mathematics			STHE 375 3 hrs.	
SMTH 120 3 hrs.		MATHLIS T	SCOM 490 3 hrs.	
SMTH 201 3 hrs.		MATHLIS T	Group Requirements	
Group 3 Arts and Humanities			Major Elect 3 hrs.	
Fine Arts 3 hrs.		FINARTLI ST	Major Elect 3 hrs.	
SHST 101, 102, 111, or 112 3 hrs.		HISLIST	Major Elect 3 hrs.	
Elective 3 hrs.		RELIGLIS T	Major Elect 3 hrs.	
Group 4 Social and Behavioral Sciences			Cognate Courses	
SGIS 201 3 hrs.		POLS 202	Cognate Elective 3 hrs.	
Elective 3 hrs.		SOCBEHL IST	Cognate Elective 3 hrs.	
Elective 3 hrs.		SOCBEHL IST	Cognate Elective 3 hrs.	

1997 ASCUE Proceedings

Group 5 Natural Sciences			Cognate Elective 3 hrs.	
Elective w/ Lab 4 hrs.		NATSCILIST	Support Courses	
Elective 3 hrs.		NATSCILIST	SEGL 300+ 3 hrs.	
Group 6 Foreign Culture			SEGL 300+ 3 hrs.	
Elective 4 hrs.		FORCULLIST	Foreign Language 201 3hrs.	FORCULLIST
Elective 4 hrs.		FORCULLIST	SHST 3 hrs.	ELEC2NOTE
Group 7 Computer Studies			Free Elective Courses	
SCSC 130 2 hrs.		CSCI 101	Free Elective 3 hrs.	LITLIST
SCSC 131/137 1 hrs.		CSCI 101	Free Elective 2 hrs.	ELEC1LIST
			Free Elective 3 hrs.	SMC SERIES
			Free Elective 3 hrs.	

Notes

When one of the following notations is found, refer to Spartanburg Methodist Degree Choices Report: FINARTLIST=Fine Art List HISLIST=History List RELIGLIST=Religion List SOCBEHLIST=Social Behavioral List FORCULLIST=Foreign Culture List LITLIST=Literature List ELEC1LIST=Elective 1 List ELEC2NOTE=Elective 2 Note. 67 Hours apply toward degree program.

Spartanburg Methodist College Degree Choices Report

Literature List

Choose one course to satisfy SMC Literature requirement: LITR 201 LITR 203 LITR 202 LITR 204

Mathematics List

Choose two (2) courses to fulfill USCS' Mathematics requirement. THOSE MARKED (*) ARE RECOMMENDED AS BEST COURSES FOR THIS DEGREE PROGRAM. MATH112*MATH210*MATH121*MATH 221 MATH 122 MATH 222

Fine Arts List

Choose one (1) course to fulfill USCS' Fine Arts requirement ARTS 201 MUSI 201 DRAM 101

History List

Choose one (1) course to fulfill USCS' History requirement HIST 101 HIST 102 HIST 112

Religion Note

Choose one (1) course to fulfill USCS' Arts and Humanities elective requirement RELI 103 RELI 212 RELI 211 RELI 215

Social and Behavioral Science List

Choose two (2) courses with two disciplines represented (i.e. if you choose a PSYC course to fulfill the first course requirement, you may not choose another PSYC course to fulfill the second course requirement) BSAD 201 POLS 203 BSAD 202 PSYC 101 POLS 201 SOCI 101

Natural Science List

Choose two (2) courses to fulfill Natural Science requirement USCS' BIOL 101 BIOL 202 CHEM 202 PHYS 101 BIOL 102 CHEM 101 PSCI 101 PHYS 102 BIOL 105 CHEM 102 PSCI 102 PHYS 222 BIO 201 CHEM 201 PSCI 103 PHYS 223

Foreign Culture List

Choose a three (3) course sequence to fulfill USCS' foreign culture requirement and one (1) of the support course requirements FREN 101 FREN 202 SPAN 201FREN 102 SPAN 101 SPAN 202FREN 201 SPAN 102

Arts and Humanities List

Elective 1 List

Choose two (2) courses to fulfill SMC's degree requirements PHED 101 PHED 110 PHED 119 PHED 102 PHED 111 PHED 120 PHED 103 PHED 112 PHED 121 PHED 104 PHED 113 PHED 122 PHED 105 PHED 114 PHED 123 PHED 106 PHED 115 MILI 111 PHED 107 PHED 116 MILI 112 PHED 108 PHED 117 MILI 211 PHED 109 PHED 118 MILI 212

Elective 2 Note

Note: an additional history course is required to meet USCS degree requirements. This course can be any history course offered by SMC. Please consult the USCS transfer coordinator for more information. He can be reached at (864) 250-8870 or 503-5990. Ask for Chuck Morton.

All courses completed as part of Spartanburg Methodist College Associate Degree Program transfer to USC-Spartanburg. Due to differences in requirements for specific majors offered at USCS, not all courses from Spartanburg Methodist College apply toward a particular degree program. Students enrolled at the University of South Carolina - Spartanburg must complete all courses required by the degree program from which they plan to earn a degree.

For more information contact at the University of South Carolina-Spartanburg by e-mail to Morton-Chuck@sc.edu

Exhibit B

USCS 2+2 Agreements

Because of its commitment to inter-institutional cooperation, the University of South Carolina - Spartanburg (USCS) began developing program-to-program articulation agreements with two-year colleges in the Upstate of South Carolina. These agreements, which have come to be known as the USCS "2+2" program, allow for students, who wish to attend two-year colleges, to apply credit hours to specific degree program requirements. The "2+2" program optimizes the students time and tuition expense spent on a baccalaureate degree program while enrolled at the two-year college.

What started off as a small effort to better cooperate with selected colleges has mushroomed to well over 100 program-to-program articulation agreements. USCS offers degree programs in Biology, Chemistry, Communications, Computer Science, Computer Science-Applied Mathematics, Computer Science-Computer Information Systems, Criminal Justice, Early Childhood Education, Economics/Finance, Elementary Education, English, French, History, Interdisciplinary Studies, Managerial Accounting, Management of Operations, Manufacturing Management, Mathematics, Marketing, Physical Education, Physical Education-Corporate Fitness, Political Science, Psychology, Professional Nursing, Public Accounting, Secondary Education-Biology, Secondary Education-Chemistry, Secondary Education-English, Secondary Education-French, Secondary Education-Mathematics, Secondary Education-Social Studies/History, Secondary Education-Social Studies/Political Science, Secondary Education-Spanish, Sociology, and Spanish. Each of these degree programs has been articulated as part of a "2+2" program.

Colleges listed below are part of the "2+2" program. To access "2+2" degree programs at one of these institutions, click on the hyper-link, then choose the USCS degree program in which you are interested.

Greenville Technical College

Spartanburg Methodist College

Spartanburg Technical College

University of South Carolina - Union

If you have questions concerning "2+2" agreements, please e-mail Chuck Morton (Morton-Chuck@sc.edu)

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Exhibit C

USCS/Spartanburg Methodist

"2+2" Agreements

Click on one of the following to display the "2+2" agreement for that particular degree program.

Biology

Chemistry

Communications

Computer Science

Computer Science - Applied Mathematics

Computer Science - Computer Information Systems

Criminal Justice

Early Childhood Education

Economics/Finance

Elementary Education

English

French

History

Interdisciplinary Studies

Managerial Accounting

Management of Organizations

Manufacturing Management

Marketing

Mathematics

Physical Education

Physical Education - Corporate Fitness

Political Science

Professional Nursing

Psychology

Public Accounting

Secondary Education - Biology - Chemistry - English - French - Mathematics

Secondary Education - Social Studies/History

Secondary Education - Social Studies/Political Science

Secondary Education - Spanish

Sociology

Spanish

A New Hire Training Program for the "Old" and the "New"

Jon Mueller
Associate Professor of Psychology
Technology Implementation Coordinator
North Central College
Naperville, IL 60566
Voice: (630) 637-5329
Fax: (630) 637-5121
jfm@noctrl.edu

Background

In January of 1996, North Central College turned on its campus-wide, PC-based network. The voice, video, and data infrastructure was in place, classrooms, dorm rooms and offices were all connected, and computers were on the desktop of virtually all full-time faculty and staff. This completed what our new Dean of Faculty dubbed "Phase 1."

Phase 2, the meaningful use of the new network, was now beginning. A month or so prior to the network's opening day and for a few months afterwards, faculty and staff were provided with classes on the most essential software on the network including navigating the network and Windows 3.11, e-mail and the word processor (Microsoft Word). Additionally, beginning the summer of 1996, I was appointed to a newly-created position -- Technology Implementation Coordinator (TIC). In this role, I would collaborate with the Director of Technology Support Services, Juliet Oeffinger, the Director of the Library, Carolyn Sheehy, and others to facilitate a successful implementation.

One of the first actions I took as TIC was to create a Technology Training Group (TTG) composed of myself (convener), Carolyn Sheehy (Director of Library Services), Heather Jagman (Instructional Services Librarian), Sharon Nelson (Systems Administrator), Betty Roth (Director of Non-Credit Programs), Marlene Starzyk (Secretary, Career Development Center), and Karen Mac Gregor (Employee Benefits Assistant). The TTG surveyed the current training and support efforts on campus to determine where its efforts would be best put to use initially. We noted that other than the wave of classes accompanying the start of the new network, technology training had not been conducted systematically or regularly. Moreover, new employees were often left to fend for themselves as they tried to acclimate to their new environment and the new technology. Intraoffice training was often inconsistent and insufficient as it was often difficult to carve out time for peer tutoring.

On the other hand, technology support was quite good and prevalent. An albeit overworked help desk was in place. Books on each of the key applications were purchased for each office. Some very good computer-based tutorials were on the network. Electronic users groups were established for each of the key applications.

Yet, before new employees could know what questions to get support for, they had to be brought up to speed on the new technology and become familiar with our network. Some training for new faculty beginning in the fall was already being planned as part of a regular orientation program. No such training or orientation was available for new staff. Consequently, the TTG decided to focus a good deal of its initial energies on technology training for new staff hires, but without forgetting the ongoing needs of the "old" or current employees.

New Hire Training Program

In creating a program to familiarize new staff with the network and to integrate them more fully into the college, the TTG identified several goals it wanted to meet. First, we wanted to bring new employees up to speed quickly on the most essential applications on the network. Second, we wanted to go beyond training to make the new employee feel welcome and a part of our campus community. Third, we sought to primarily use in-house talent as presenters. Not only was it cheaper, but we wanted to create a greater sense of community as we taught each other and took advantage of different strengths and interests among the staff and faculty. Fourth, we wanted to create a flexible format that would allow us to adapt to changing needs and serve as large a segment of the current faculty and staff as possible. Fifth, we wanted to follow the model established with technology support to provide a variety of means and opportunities for training.

Following these goals as guides, the TTG developed a three-part program we called the New Hire Training Program. The first component of the program, for want of a better title, was labeled the "First Day at Work." Given that our work has become increasingly dependent on information technology, new employees need immediate training as soon as they start their jobs. The best place for that to occur is at the location where the employees work. Thus, we proposed that the new employee's supervisor be responsible for insuring that within the first day or two on the job that the new hire be taught a common list of essential skills such as logging in and out of the network, changing passwords, sending and replying to e-mail, using the voice mail system, etc. (See Appendix A.) New employees would also be given the list so that they know what training they would receive. It would be up to the supervisor to determine who would deliver the instruction, likely the supervisor or someone else in the office assigned the task. The list of skills was simple enough that it should not take much time or expertise to administer the training.

With the "First Day at Work" training, other informal training from colleagues, and the technology support system we have in place, the TTG believed that new employees could "survive" technologically until they attended the second component of our program, The New Hire Training Day (NHTD). Scheduled the fourth Friday of each month, the NHTD was designed primarily to take new hires a little beyond the basics they learned initially. We identified the key applications that all new hires are likely to use and NCC staff or faculty who could effectively present these topics. Presenters were drawn from librarians, network administrators, faculty and the executive assistant to the president. We developed the following schedule for our first NHTD this past fall:

8:15 - 8:30	Welcome / Coffee
8:30 - 9:15	"Advanced" phone training
9:15 - 10:00	Network / file management
10:00 - 10:15	BREAK / QUESTIONS
10:15 - 10:45	"Advanced" cc:Mail
10:45 - 11:15	Netscape / Internet
11:15 - 11:45	Faxing / Miscellaneous / Tutorials
11:45 - 12:00	"Playtime" / Questions
12:00 - 1:00	LUNCH
1:00 - 2:00	Word (a little beyond the basics)
2:00 - 2:15	BREAK
2:15 - 3:15	Word (Special Topic - Mail Merge)

A great deal of flexibility was built into the schedule. For example, because we would be using in-house presenters, we could more easily adjust the schedule. After the first NHTD, we recognized that only 30 minutes were needed for the phone training and more time was added to the important explanations of network basics and file management. Similarly, sufficient "fudge time" was included to allow presenters to run over when necessary.

Because anywhere from zero to eight new staff were hired each month, we had the flexibility to allow current faculty and staff to fill the remaining seats in our training lab with ten PC's. After new hires had RSVP'd, an e-mail message would be sent to other employees inviting them to sign up for one or more sessions. Faculty and staff could select which session(s) would best suit their needs. Similarly, although new hires would be encouraged to attend all the sessions designed for them, the new hires might only attend a few because of prior experience or the nature of their work. Or, for a variety of reasons, a new employee might skip that month's NHTD and attend the following month.

The sessions from 8:15 - 2:00 were specifically designed for the new employee. After an introduction and welcome, new hires would be given hands-on training on several applications, with some time to practice. Lunch would also be provided. One of the presenters and I would normally attend lunch to answer questions, learn more about the new employees and further welcome them to the college.

More specialized topics were planned for the afternoon with the current employees in mind. This format would allow us to rotate different topics across the year responding to training needs.

As a final stage of welcome and transition for the new employee, we developed a New Hire Orientation Day. Once a new hire has a chance to become acclimated to the college and the job, we sought to further cement the bond with a formal welcome from key personnel and a tour of the campus. Specifically, we planned the following agenda:

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- 8:15 am Introductions
- 8:30 am President Wilde will welcome attendees
- 8:45 am Mike Moser (Director of Alumni Relations) will give a brief history of NCC
- 9:05 am Showing of "A Direction For Life" -- a video used by Admissions to describe the college
- 9:25 am Laurie Hamen (Associate Dean of Students) will speak briefly about the role we all play interacting with students
- 9:45 am BREAK
- 10:00 am Tour of campus -- staff people in each of the key offices will describe what faculty and staff need to know about their offices and how their offices relate to students
- 12:00 pm LUNCH

Many current employees report being unfamiliar with other offices and their functions at the college. Consequently, we included a tour in the orientation day, but we designed it so that the tour would stop at key offices on campus for additional information. Moreover, instead of having the tour guides deliver descriptions of office functions, personnel within each of the designated offices would describe the role their office played at the college.

Finally, we sought and received institutional support from the top administration and supervisors across campus for the New Hire Training Program. Everyone involved was enthusiastic about the plan and its prospects for improving productivity and staff retention.

Implementation

Because several new employees had been hired in the fall while we were planning the program, we wanted to set up and pilot a New Hire Training Day quickly so these new employees would not be left behind. Thus, we began implementation of the program with the second component in late fall. Using the schedule listed above, we had no difficulty filling the ten seats for each session with a mixture of old and new staff and faculty. (A waiting list was also maintained to determine the level of interest for the different topics.) Follow-up calls were made to the few new hires who failed to sign up for the day. They typically reported that previous work experience prepared them sufficiently to use the applications on our network. Binders were prepared for each new hire that included instructions and quick tips on each of the applications covered. The new employees took the binders with them as a resource and to add to them as new quick tip sheets were prepared.

We offered a second NHTD in December with only a couple modifications. We shortened the phone training and lengthened network basics to reflect the actual time necessary to address the topics. We also added another special topic after mail-merge -- using Excel as a gradebook for faculty.

Three additional NHTD's have been offered this year to new and old staff and faculty. Training days in February and April were canceled because so few new staff were hired those months. The remaining days were sufficient to handle demand for the training.

While the new hire portion of these days remained the same (8:30-2:00), we changed the special sessions offered in the afternoons for current employees. After demand had been met for mail merge

in the first two days, we switched the Word topic to templates. We also added FERPA training and web page development (HotMetal Pro 3.0) to our offerings.

After the TTG got a few training days under its belt, we began implementing the First Day of Work for each new staff person hired by working with the respective supervisor. Some supervisors went further by customizing the First Day of Work list for their offices.

Finally, we offered our first New Hire Orientation Day this spring to all employees hired since January, 1996. Most new employees attended and welcomed the conversation, exposure to the wider campus, and pertinent information to their work.

Results

By all accounts, the New Hire Training Program has been an early success. Feedback sheets sent to participants about a week after the sessions revealed consistent appreciation for the new program. We received comments such as:

"Every part of the training was excellent and valuable to my job. I would not change the class in any way except to maybe have more time in the workshops."

"It is a very valuable tool to the new employee. It helps answer those questions you have plus knowledge on things that you didn't know existed. Shows how everything on campus can work. Thank you!"

"It is very valuable to learn from someone who has worked in the same environment as I work and knows some of the problems I face and has suggestions for how to do the tasks I need to do."

"It was a wonderful day. Recently being hired that same week, a lot was so new and have not used yet. Now when I see or hear it, I have some background knowledge. I would not change anything."

"I was so impressed that NCC would offer these seminars that were so knowledgeable in all areas. Each presenter did a great job. Thank you for this beneficial day!"

Generally, new and old employees were thankful for this opportunity to be able to put their work aside for a short time so that they could be more productive in that work when they returned to it. All the sessions were flexible enough to handle the specific questions employees came with as well as to provide direct instruction and practice on new skills. Presenters were also pleased with what they were able to deliver in this format and what they saw the new and old employees learn. As fellow employees, the presenters really enjoyed sharing their expertise. For the executive assistant to the president, for example, this opportunity allowed her to contribute in a manner that was not part of her regular job description. Supervisors have also been very supportive. They have encouraged their staff to attend one or more of the sessions, leaving that decision to the employee.

What we have learned

Along with the praise for the New Hire Training Program, we also received some good suggestions for improvements. Slight modifications of the schedule were made to more accurately align the topics with the length of time assigned them. Specific topics have been suggested for future training. More special sessions on advanced topics will be added in the future as current employees become more and more comfortable with the basics, and as new employees enter with greater technological knowledge. In fact, as fewer and fewer current employees need the training we are offering the new hires, we may soon abandon the format of the New Hire Training Day for something even more flexible.

Through all of our training and support efforts we have learned that a "training the trainers" model is quite useful. We occasionally bring an outside expert onto campus to provide some more advanced training to certain dedicated users, with the understanding that those users will share their expertise in some manner. They may serve as workshop trainers, make house calls to offices or just be "on call" to answer telephone or e-mail questions. For example, we have created a page on our Intranet entitled "Whom Can I Call?" Listed there are names of faculty and staff associated with specific network applications who are willing to answer questions about that program.

Most of all, we have learned that new employees appreciate joining an organization that supports them, is interested in them, and looks to find ways to assist them to perform their work more effectively. The good will the program has created among the developers and the participants has been its most significant contribution so far.

Appendix A

New Employee Technology Training Checklist for Supervisors

The purpose of this checklist is to identify basic technology skills that all new employees should learn within their first three days on the job. The expectation is that the employee's supervisor or a co-worker will show the employee these skills. Other skills will of course be required by the employee depending on the position he/she holds, but these basic skills are applicable to all employees.

The first four categories are important to every employee as the telephone and e-mail are essential tools for communication at the College. The last two categories are important to all clerical and administrative staff and to faculty.

At the end of the third day of work at the college, new employees should be able to:

I. Network Skills:

- Log into the network
- Log out of the network completely (don't just turn off the PC)
- Change their network password
- Know where their network "home" directory is
- Know where "group" ("N:") drive files that are used by their office are

II. cc:Mail:

- Log into cc:Mail
- Set their initial cc:Mail password (the first thing typed in the "password" field becomes the password)
- Change their cc:Mail password
- Read their incoming mail
- Reply to a message
- Send a message to an on-campus address
- Send a message to an Internet address
- Know their own Internet address ("xxxxxxx@noctrl.edu")

III. Telephone:

- Access their voice mail
- Change their password on voice mail
- Record their personal greeting
- Transfer someone
- Put someone on hold

IV. Where to get help with technology:

- Know where network tutorials are and how to start them
- Know where paper documentation on technology is kept in their office
- Know the Help Desk telephone number
- Know how to send e-mail to the Help Desk

V. Word:

- Know how to start Word
- Know how to start a document
- Know how to save a document
- Know how to retrieve a document previously saved

VI. Datatel:

- (This will vary extensively from office to office but there are a few basics)
- Log into Sequent/Datatel
- Change their password
- Start appropriate modules
- Log out of Datatel/Sequent

Is Your Curriculum Up-to-Date

Dr. Thomas A. Pollack
A.J. Palumbo School of Business Administration
Duquesne University
Pittsburgh, PA 15282
412-396-1639
pollack@duq2.cc.duq.edu

Abstract

The dramatic changes that occurred in information technology in the 1990's have rendered the curricular offerings of many college and university information systems and computer science programs obsolete. Traditional curricula that have not been updated in the past several years may not be providing the skill base students need to compete in today's technology work environment. Maintaining currency requires a constant process of monitoring technological innovation and market conditions.

This session will identify some of the most desirable skills in the current technology environment and provide a forum for interactive discussion of how to incorporate the desirable skills in a curriculum. A sample curriculum plan will be presented for discussion purposes.

Introduction

Today's successful information systems professionals must demonstrate strong analytical and communications abilities along with a willingness to participate in life-long learning. Our educational programs can equip students with the foundation knowledge and skills necessary to begin careers as information systems professionals; as professionals however, they must have a commitment to continue the learning process throughout their careers. In addition to technical expertise, information systems professionals must also demonstrate excellent "soft skills". General communications, interpersonal and organizational skills are extremely important in the management of people, in the negotiations process, and in interdepartmental and inter-business dealings.

The Changing Nature of Higher Education

Educational programs in computing and information systems cannot be static. The field is changing and evolving rapidly, and all indications are that it will continue its rapid rate of change in the future. For years, businesses have wrestled with the reluctance of people to want to change. Educational programs, especially those related to technology, are faced with many of the same problems. Faculty wish to continue to teach the material that provides them with a "comfort zone", often at the expense of the preparedness of their students. It is difficult for many information systems faculty to be aware and to maintain pace with the rapid rate of change in the field. To compound matters, many institutions do not have adequate budgets to maintain hardware or software currency in their computer laboratories. In addition to serving our students, there are other reasons that make change an important consideration.

Higher education in general is currently facing many challenges, some related to the very technology that we teach. Will our campuses disappear in the future? Although virtual colleges continue to struggle with the stigma of their forebears, virtual degrees are now being offered by about 300 colleges and universities (Hamilton, 1997). Not even staunch proponents of online education believe academia's hallowed halls will disappear any time soon, but there is one notable exception. Peter Drucker, at age 87, is generally regarded as one of the most perceptive observers of the American scene. Drucker opines "Thirty years from now the big university campuses will be relics. Universities won't survive. It's as large a change as when we first got the printed book. ...Already we are beginning to deliver more lectures and classes off campus via satellite or two way radio at a fraction of the cost." As Drucker alludes to the rapid growth and acceptance of distance learning, he also states that "the cost of higher education has risen as fast as the cost of health care and, as a result, higher education as we know it is in deep crisis" (Lenzner and Johnson, 1997).

The uncertainty of what will happen with distance learning also poses a threat to each of us and our programs. As alliances are formed among institutions of higher education, the alliances could signal an end to the traditional means of course delivery. For example, BBN Systems and Technologies envisions educational programs as entities within an electronic mall. BBN "envisions a world where personalized learning occurs when and where the individual or community needs it, freed from traditional restraints of time and place" (BBN, 1997). The subscriber will have an opportunity to choose best-in-class courses from the electronic mall, at a time that is convenient, and the courses will be delivered via the Internet. The obvious threat is one of competitiveness. If our programs and courses are not the best-in-class, they will never be chosen. If we find the demographic data credible which indicates that, in the future, there will be more students of non-traditional age attending college classes than those of traditional age, it is not difficult to believe that distance education will be a very popular mode of delivery.

How about the threat of corporate universities? Can we afford to be complacent when more than 400 organizations who provide financial support for our students' education, particularly graduate education, claim that what we teach is not relevant, and therefore they plan to start their own universities? Meister (1996) states that corporations feel there's a gap between what is taught in academic institutions and what corporations require from IS employees. Many of the corporate universities actually plan to seek accreditation from the very same accrediting agencies that accredit us. As corporate universities become accredited, those of us who are skeptics on the basis of claiming that they offer training versus education will be silenced somewhat. The competition will be real and we will be forced to deal with it.

The above points are made to serve as a reminder of the amount and type of change that is taking place around us. None of us can afford to ignore change as we, too, can become victims of the change process. Change is difficult, and people resist it. Callon (1996), presents the following Law of Change: "Achieving change, of any significance within an organization, is in inverse proportion to the success that it has had up to the time that management feels a change is needed. The greater the success of the company, the less likely it will change." Those with long-standing successful programs may actually find it more difficult to change. Change and downsizing are not limited exclusively to our friends and neighbors in the corporate world. It is imperative that we offer our students the finest and most up-to-date programs that we are capable of delivering, and that means that we must continuously assess and change.

The Skills That Are in Demand

The question then becomes, How do we go about the process of assessing our curricula and implementing those changes that are appropriate? Where is the fine line that separates education from training? Efrem G. Mallach (1996) contends that we should teach students to work and live during technological change while maintaining evolving curricula. He states that graduates need the skills to get the first job, but more importantly they need the capability to keep learning. Today's technology environment, however, insists on some exposure to current hardware and software tools. The rapid changes that have occurred in information technology over the last several years make it imperative for us to constantly examine our curricula for currency. The basic economic law of supply and demand has created a tremendously rewarding employment environment for those with the proper skill set or experience. It is truly an employee's market, and by being astute innovators with our curricula, we can ensure that our graduates can receive a quality education and also be competitive in the marketplace.

A current study by the Information Technology Association of America estimates that there are 190,000 vacant information technology jobs available (Business Week, 1997). The Big Six consulting firms and hundreds of smaller operations are paying six-figure salaries for technicians. The most sought after technicians are programmers for products such as Germany's SAP or its U.S. rivals Oracle and PeopleSoft (Ibid.).

Another significant area of need is for IS professionals who can resolve the year-2000 problem. Organizations are beginning to panic as they realize that they don't have the staff to handle year-2000 conversions. In particular demand are skills such as COBOL, CICS and the general willingness to make legacy system programs year-2000 compliant (Ulfelder, 1997). Opportunities for conversion work beyond the year-2000 will be available and the 2000 project provides a great opportunity for recent graduates to gain experience.

The fastest growth areas continue to be the Internet and Intranet. One study estimates that there are 760,000 technicians working at Net-related companies, up from virtually none five years ago (Baker, 1997). IS shops have an insatiable demand for networking, Java, and HTML expertise (McGee, 1997). Typical salaries being quoted for those who have one or two years of work experience with web site development, and who are fluent in HTML, are in the range of \$50,000 - \$75,000. Networking opportunities are greatest for those with knowledge of TCP/IP, Ethernet, and Microsoft NT Server (Menagh, 1996).

Another "hot area" is experience with a relational databases and an emphasis on client/server programming; and if you can boast experience with more than one database, your future is positively rosy (Merragh, 1996). The demands are being escalated because of client/server computing and data warehousing (Lyons, 1997). Many employers are beginning to consider database experience essential and prospective employees will be well-compensated for relational database knowledge, especially when it's combined with other expertise. One observer opines, "If you've got skills in Microsoft, Oracle, and Internet, you'll be making \$85,000-\$90,000 rather than \$40,000 to \$45,000" (Ibid.).

The 1997 Computerworld Annual Skills Survey did an excellent job of summarizing and ranking the skills currently in demand (Wilson, 1996). How closely you want your curriculum to resemble the skills listed depends very much on the approach and philosophy of your program.

Wilson reports that those who will be hiring in the next 12 months arrived at a ranking of the top skills across a number of categories (Ibid.). The order in each major group is as follows:

Languages:

HTML, C++, Cobol, Java, C, Micro Focus Cobol

Development Tools:

Microsoft Visual Basic, PowerBuilder, Visual C++, Oracle Developer/2000, Progress, Borland Delphi

Networking:

LU6.2, APPC, TCP/IP

RDBMS Administration:

Oracle, Microsoft SQL Server, Sybase SQL Server, DB2, Informix, Progress

Client/Server Applications:

Oracle, PeopleSoft, SAP

Operating Systems:

Windows NT, Windows 95, Windows, Unix, AIX, DOS, MVS

Lan Administration:

Windows NT Server, Novell NetWare, Ethernet, HTTP, OS/2Warp

Office E-Mail/Groupware:

Microsoft Exchange, Lotus Notes, CC:Mail, Novell GroupWise

As a follow-up to this survey, Wilson (1997) later reported the top five skills for jobs with starting salaries over \$40,000. They include; C++, UNIX, Visual C++, HTML, and Microsoft's NT Server.

Employer's are bidding against each other and raiding other companies to acquire the skill sets they need. Not to be forgotten are the previously-mentioned interpersonal skills: "soft skills" are a must. IS managers sound the same litany: "People" will get hired first (Menagh, 1996). Nearly all of the 90 skill areas in the Computerworld survey indicated premiums for seasoned full-time staff and contractors. Employers' willingness to pay salary premiums is an indicator of the favorable employee marketplace (Ibid.).

The technical and interpersonal skills referenced above are essential. However, employers are also placing a great deal of emphasis on another category, namely real-world experience obtained through participation in an internship or co-op program. Wilson (1997) asserts that business experience is important for several reasons. First, students learn about business concepts and terminology which helps with the communications process, and second, students learn to apply the theory they've learned in school to real situations. "A whopping 93% of the recruiters and IS managers in the Computerworld Careers Survey said internships are an important factor on job candidates' resumes"(Ibid.). Other activities which add value include personal development of a Web page or serving as a laboratory assistant (Ibid.).

The Duquesne University Information Technology Program

The Information Technology faculty spent the summer of 1996 revising the former Management Information Systems curriculum in order to reintroduce it as a totally revised program in Information Technology. The general consensus was that information technology is a term that is more appropriate today, and also more likely to make sense with entering freshmen. Management Information Systems, the business school's counterpart of the more recognizable liberal arts' Computer Science program, required an explanation for a typical freshman. Much of the discussion that took place in our curriculum committee meetings centered around the types of competencies that employers will be seeking four and five years hence. There was a great deal of deliberation as the research findings, experience and opinions of six individuals were factored into a very complex equation. Our advisory board, consisting of eighteen middle to high level information systems professionals was consulted. Students who were recent graduates of the program and who are working in an information systems capacity were questioned and asked to identify strengths and weaknesses of the program while providing suggestions. Faculty resources as well as hardware and software resources were considered as was additional faculty training in deficient areas. All of the above were considered important in the curriculum revision effort.

Meeting for half-day sessions no less than three times per month, the project took the entire summer. The outcome of the sessions included agreement among the faculty as to the purpose, scope and sequence of each of 10 courses. In keeping with a School policy, we developed a master syllabus for each of the courses. The master syllabus ensures continuity within the program by stipulating coverage of common and essential topics, regardless of instructor. The instructor, then, is expected to develop his/her course syllabus using the master syllabus as a guide. A rule of thumb is that the instructor's syllabus should follow the "80 - 20 rule"; eighty percent of the content is common and stipulated by the master syllabus and twenty percent is the discretion that an instructor has to customize a course based on personal experience and research. Assistant Professor, Dr. A. Graham Peace agreed to assume the role of chairman of the Curriculum Committee, and coordinated the overwhelming task of the syllabus revision process. The School uses a standard syllabus format, and Dr. Peace was extremely effective as "the enforcer" in accomplishing standardization across all revised syllabi. Such a take-charge person is critical in the development of a set of written curriculum materials that is comprehensive, cohesive, well-articulated. The project would have been doomed for mediocrity had it not been for the efforts of Professor Peace.

The program that resulted is featured in the illustration that follows (Peace, 1997). Obviously, it is not possible to include every "hot skill" that was mentioned in the previous section. We do feel, however, that we are able to provide a very solid conceptual foundation for future learning. The program develops analytical and problem-solving skills while providing experience with some of the in-demand software products. Our rate of student placement, even prior to curriculum revision, was nearly 100 percent. We are confident that students who complete the program that follows will find excellent opportunities in the employment market they will face at graduation.

UNDERGRADUATE I/T PREREQUISITES AND SEQUENCING

- Prerequisites must be completed before taking the listed class.
- Concurrency requirements must be completed before or taken concurrently with the listed class.

Course	Prerequisites	Pre or Concurrency Req.
MIS 182 Info. Sys. I		
MIS 183 Info. Sys. II	MIS 182 Info. Sys. I	
COCS 101 or 150 Prog.	MIS 183 Info. Sys. II	
MIS 382 Programming	COCS 101 or 150 Prog.	
*MIS 384 DSS	COCS 101 or 150 Prog.	
MIS 385 Computer Systems	COCS 101 or 150 Prog.	
MIS 481 Analysis & Design		MIS 482 Database COCS 101 or 150 Prog.
MIS 482 Database		COCS 101 or 150 Prog.
MIS 483 Project	MIS 382 Programming MIS 385 Computer Systems MIS 481 Analysis & Design MIS 482 Database	
MIS 484 Networking	MIS 385 Computer Systems	
*MIS 487 Adv. Sys. Conc.	MIS 481 Analysis & Design MIS 482 Database	
*EDP Auditing	COCS 101 or 150 Prog.	
*Computer Simulation	COCS 101 or 150 Prog.	
*Groupware	COCS 101 or 150 Prog.	

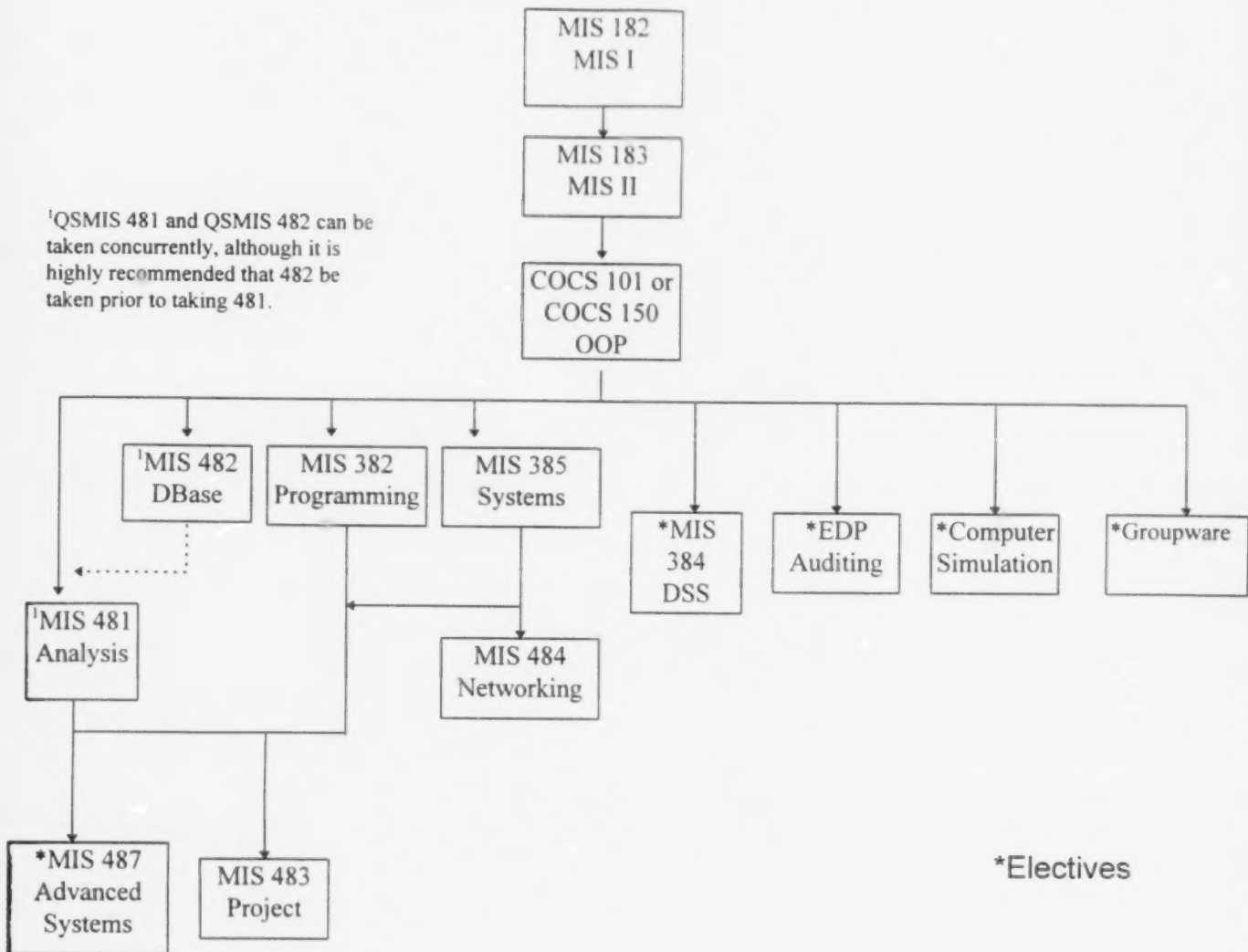
RECOMMENDED PARTIAL COURSE SEQUENCING

Term	Recommended MIS Courses
Freshman Fall Term	MIS 182 Information Systems I
Freshman Spring Term	MIS 183 Information Systems II
Sophomore Year	COCS 101 or 150 Programming
Junior Fall Term	MIS 382 Programming MIS 482 Database
Junior Spring Term	MIS 385 Computer Systems MIS 481 Analysis & Design
Senior Fall Term	*MIS elective MIS 484 Networking
Senior Spring Term	MIS 483 Project *MIS elective

* Electives

- A three credit Internship in either the Junior or Senior year is also very strongly recommended

UNDERGRADUATE I/T CURRICULUM



I will now comment briefly on the rationale for design of the illustrated program of studies. As indicated earlier in the paper, the scope and sequence of our course coverage are the result of a very time-intensive, interactive exchange of ideas among the faculty teaching in the Information Technology program. The many ideas incorporated originated from a variety of sources.

Although our students do not officially begin taking business courses until their sophomore year, for the past 12 years, we have front-loaded two technology-intensive courses in the freshman year. Students who are admitted into the business school as freshmen must complete our Information Systems I (MIS I) and Information Systems II (MIS II) courses. Briefly described, the MIS I course provides comprehensive computer literacy including Internet coverage. The Microsoft Suite of products is currently the software of choice. The MIS II course essentially introduces the student to information systems and the importance of information in today's

organizational environments. Also included in the course is a relational database package, currently Access. The rationale for front-loading the two courses is to ensure that all business students have basic computer and information systems competency prior to taking any business-related courses. It is expected that many of the business courses will integrate appropriate software applications and students will be adequately prepared.

During their sophomore year, Information Technology students are required to complete a programming course from the Computer Science Department. Their choice is between Visual BASIC, and C++. The rationale is to develop logical problem-solving skills and a fundamental understanding of the programming process.

During the junior year, students have a more intensive mix of courses from their area of concentration. Hence, most students will take twelve to fifteen credits toward their area of concentration. Included among their courses in the first semester of the junior year is a second required programming course; currently object-oriented COBOL using Micro-Focus COBOL. Students are also advised to take the Introduction to Database Management course concurrently. The course emphasizes relational database management systems and conceptual data modeling, and the software tool is Access. As second semester juniors, students are advised to take the Computer Systems course, dealing with computer hardware and operating systems (including UNIX) and Systems Analysis and Design which stresses the system development process, project management, object-oriented design considerations, and the use of a CASE tool.

During the latter part of the junior year, the summer prior to the senior year, or during the senior year, we strongly advocate an internship experience. Most of our internships are paid and account for three credits, but some students have earned up to six credits through internships. The demands of the internship experience must be increasingly complex to warrant six credit approval. Faculty approval and oversight sponsorship are required.

The curriculum allows for two required courses and two electives during the senior year. Requirements include Networking (Windows NT and Novell) and the capstone course, Project Management which presents a comprehensive live project. A strongly advocated elective, Advanced Systems Concepts advances the educational process in the areas of analysis and design and database management using Oracle as a development tool. Other electives, based on the student's area of interest, include Decision Support Systems, EDP Auditing (offered by the Accounting faculty), Computer Simulation (offered by the Quantitative faculty), and Groupware (currently under development).

Summary

We are facing rapid changes in information technology and in higher education. There are some who feel that if we in higher education do not change, we may be replaced by new organizations that are more nimble, responsive and cost-effective (Kidwell, 1997). In the constantly changing area of information technology, annual curriculum reviews must become a routine practice.

Maintaining awareness of developments in the field and reacting with appropriate curriculum modifications will ensure continuous improvement and well-prepared graduates. Students are

our products, and they will gain competitive advantage for our programs by being stellar performers.

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Supporting Student Teachers with Laptop Computers: A Project of the School of Education at Columbus State University

Dutchie Riggsby
Professor of Education
Columbus State University
Columbus, Georgia 31907-5645
phone: (706) 568-2250
fax: (706) 569-3134
riggsby_dutchie@colstate.edu

Three Years ago my colleague and I were encouraged to investigate the concept of electronic portfolios for use in education by our Dean, Dr. Arthur Justice. A search of research data bases, investigations on the net, and inquiries on the Web and to professionals at meetings were conducted. We found that there was very little information available on the topic. As a result of the findings, we became intrigued with the development of electronic portfolios. Being considered one of the pioneers in the area also appealed to us. Initially, the exploration of this means of organizing and presenting the accomplishments of our students was an effort to help them develop an unusual resume. As we worked with the students, all we could provide them with was a session that provided exclusive use of the computer lab in the School of Education. We set up a special night, and Saturday morning hours for them to have exclusive use of the facilities and have special instruction in any new technology which might be made available.

The major difficulty of the participants having time to work on the design of their electronic resume was complicated by the fact that we needed a common carrier for the design. The Hypercard software which we were using did not provide the desired color nor desirable special effects features, so another package, Digital Chisel, was selected. The flexible license for this software made it possible for us to load it on as many machines as we owned or purchased. In addition, the license provided that we could let the students in the School of Education load it on their own machines at home as long as they were in the program. With the potential to load Digital Chisel on any number of machines, it was most attractive for us to try to acquire additional computers. At this point, we began to look at the type computer we might wish to acquire, as well as where we might house them. As with many academic settings, we had very little flexible space in which to house a new lab, and inadequate security to share the space with existing classes.

At this point, the flexibility of laptops was considered. With this type computer, we could easily store the units when not in use: provide usable space in almost any office, classroom, or lounge area; and increase the potential use of each machine. In addition, the units could go with the student into the classroom and do double service there, helping the student teacher with classroom management tasks, and providing an example of technology use. Classroom teachers could see what this technology might do, selected software could be loaded on for use by the student teacher in the teaching environment, and software could be previewed at leisure by both the student teacher and supervising teacher. When not in use by student teachers, the laptops could be made available for professional support for research work since each would have internet access software, loaded with

presentation software, it would be used with LCD projection equipment to share with audiences. This would make it possible for faculty to prepare and present more interesting presentations.

The case being built, we engaged in the activity of writing a grant proposal to the Georgia Public Service Commission who was administering funding. In approaching the PSC for funding, we had to address a need and outcome that would be viewed as worthy of the allocation. Choosing to request laptops for the development of electronic portfolios and as means of providing student teachers with portable technology seemed to fit the criteria, and we received the funding.

Our labs for the School of Education were Macintosh, so it was natural that we selected Macintosh laptops for the project. An attractive "bundle" pricing helped in getting more machines than initially expected. The grant provided enough to purchase 15 laptops. This would not service all the student teachers we had each quarter, but it would provide a good base to identify a select group to receive this support.

Beginning with the receipt of the units, the plan for selection of participants had to be established. Basically, the students had to have completed our basic computer applications course, exhibited mastery of a presentation package, demonstrate ability to be self motivated and directed, and express a desire to be part of the project. Names of all students who fit the criteria were then put in the pool and after deliberation, those selected were notified. Those chosen had to respond with an indication of interest and commitment to complete the project. From those, the final participants were selected. The first meeting date was set up to allow time to go over the rules for use of the laptop, operation of the laptop, setting lab usage times, and signing necessary paperwork for loan of the equipment.

The rules for use of the laptop stress the responsibility of the student to take advantage of the portable nature of the machine and to provide security for the unit. The features of the laptop make it a high security risk. There was also the factor of the nature of the machine that made it necessary to stress the fact that the laptops were intended for use by the student teacher and not other members of the family or friends. The new user is provided with e-mail and internet access in conjunction with a session on how to access the campus LAN system. The Macintosh 520 was equipped with modem and connection software for our campus LAN system which provided the user with either Pegasus or Eudora for e-mail and Netscape. This provides the student teacher with *access* to faculty, library resources, and the world wide web from any phone plug, and at no cost for the service. The savings in connectivity was at least \$19.95 for each of the three months of student teaching. Each laptop was loaded with two presentation packages, such as, Digital Chisel, HyperStudio, or PowerPoint. Additionally, the software included Microsoft Works and a varied selection of software which the individual user may need depending on grade level and subject matter needs.

As the participant was introduced to the classroom, in the course of student teaching, the importance of the variety of activities were stressed as those which might be selected for consideration as excellent examples of skills and achievement to be included in the portfolio. The student is encouraged to be creative in the development of the portfolio in an effort to reflect individuality. Also, diverse appearance made each selection seem more customized and increases interest on the part of the viewer, particularly as more of these portfolios reach the desks of area principals and hiring agents.

The participant is encouraged to practice, not only the computer skills he/she has learned, but to experiment in the use in a variety of ways. For example, the use of Microsoft Works Wizard for a newsletter may also be used for page size poster, notice, or presentation cover. Exploration of various productive software packages may add to the possible sources of curriculum support materials, as well as, potential examples for inclusion the portfolio.

During the lab sessions, each participant is encouraged to use the laptop as a means to facilitate the mastery of new skills in the use of applicable software packages. Digital cameras with appropriate software are used to capture such things as classroom activities, bulletin boards and other display items. The use of student portraits for inclusion in newsletters, as a means of identification, and for classroom decoration are covered. Learning how to use projection systems, composite projectors, LCD panels, and tv-ators, increases the effective usage of the laptops. Digitizing tables provide an added dimension for creating visual materials and adding impact to the creations of the user.

As the quarter progresses, the participants work on incorporating the selected samples into the electronic portfolio and at the same time, increasing their skills in the use of the software application of choice. This helped the students in the development of a more sophisticated final product, as well as, perfecting the skills necessary to the mastery of this form of technology. At all points along the way, the students were encouraged to use the capacity of e-mail to keep in touch with faculty on campus as questions needed to be answered, resources needed to be located, or appointments needed to be set up. The use of internet was used for research, setting up classroom activities, and developing resources for the units of study. Locating lesson plans on the internet was also addressed as a use of resources.

At the conclusion of the quarter, each participant is required to present his/her finished product to the group. This showing, provided an opportunity for the participants to see how others presented their materials and get ideas for upgrading or including areas which were not considered. After the laptops are returned, the upgrades are done on desktop computers in lab or at home at any point before the student directed the final product be placed on CD-ROM.

At the end of each quarter the laptop is cleared of all extraneous programs which may have been loaded on for the use of the individual using that laptop. After checking for operation, verifying the accessories, and charging the battery, the laptop is again ready for the task of introducing a new user to the fascinating world of the laptop.

An additional use of laptop computers has been one that permits us to "trade" the use of the laptop to selected students for the purpose of providing additional lab time for class use. In an effort to expand the services of our lab, we can use this approach to "buy" the time necessary for student use. The students selected to use the laptop computers in this manner must sign an agreement that they will devote at least two hours per week to keeping the lab open and providing tutorial time to students enrolled in the basic technology courses in the School of Education. They must use the laptops for class assignments and to help in the production of class support materials, as needed. This practice has only been in operation for two quarters and the maximum participation is two students per quarter.

Again, the use of the laptops to service student needs is one that has evolved from our desire to incorporate technology into the classroom and encourage the general use of computers. Laptops are generally accepted as the near perfect means to support our program and to provide a tangible connection to the campus from the field. The e-mail and Netscape link us to the student and his/her world quickly which enhances both our jobs and facilitates the problem-solving necessary to a successful student teaching experience.

Evaluating the Effectiveness of a Formal Ethics Component in the Computer Science Curriculum

Stephen J. Sheel, Ph.D.
Department of Computer Science
steves@coastal.edu
(803) 349-2081

and
E. Eugene Collins
Department of Computer Science
gene@coastal.edu
(803) 349-2072

Coastal Carolina University
P.O. Box 261954
Conway, South Carolina 29528-6054

Abstract

In the Fall of 1994, the Computer Science Department at Coastal Carolina University implemented a formal ethics component in the introductory computer science course required of all majors. Prior to the introduction of this ethics component into the curriculum, a survey of ethical attitudes was administered to all computer science majors. Two years later, a similar survey was given to computer science majors who have completed the ethics component. This paper contrasts the results of the two surveys as a method of analyzing the effectiveness of the department's strategy to promote ethical behavior. The results suggest the need to reevaluate existing strategies for promoting ethical behavior. The paper concludes with a discussion of varying strategies for promoting ethical behavior and suggestions for further study.

Introduction

Ethical practice and social responsibility have become important aspects of computer science education. The latest revision of the computer science curriculum, Computing Curricula 1991 [1], states that "undergraduate programs should provide an environment in which students are exposed to the ethical and societal issues associated with the computing field". According to Tucker, Barnes, and Aiken [10], in a summary report for Computing Curricula 1991, computer science students "need to be aware of the basic legal rights of software and hardware vendors and users, and they also need to appreciate the ethical values that are the basis for those rights. To provide the level of awareness, undergraduate programs should devote explicit curriculum time to the study of social and professional issues".

In the spring semester of 1994, the authors of this paper examined the ethical attitudes of 82 computer science majors enrolled at Coastal Carolina University in response to a survey that

appeared in Effy Oz's [7] textbook, "Ethics for the Information Age," 1994. It was concluded that "Coastal Carolina University is not doing enough to promote ethical behavior." [2] As a result of that survey and to meet the requirements of the ACM/IEEE curriculum guidelines, it was decided, starting in the Fall semester of 1994, to implement a formal ethical component in CSCI 130, Introduction to Computer Science. This course provides a comprehensive overview of Computer Science as a discipline and is required as the first course for all students majoring or minoring in Computer Science. All professors teaching this course were asked to add an ethical component to their course syllabi, and portions of Oz's textbook [7] were adopted as a required supplemental text.

In an attempt to assess the effectiveness of the Computer Science Department's formal ethics component, another survey of ethical attitudes similar to the 1994 survey was conducted two years later, in the fall of 1996. The first survey was administered to students who did not have the ethics component as part of their curriculum, and the second survey was administered to students who did have the formal ethics component as part of their curriculum. In particular the study focused on the following questions:

1. What is the current attitude of the students regarding ethical issues?
2. Is there a difference in ethical attitudes between students who have had the formal ethical component and earlier students who did not?
3. How effective is the current strategy to promote ethical behavior?
4. What changes in the curriculum are suggested?

Methodology

The survey instrument was administered to 66 computer science students consisting of 2 freshmen, seven sophomores, 20 juniors and 22 seniors. Of this group, 51 had completed the formal ethics component found in CSCI 130 at Coastal Carolina University. Oz's original survey was designed to measure the moral imperative that illegal copying of software is inappropriate in all circumstances. Since Oz's survey was included in the material covered in the ethics component found in the CSCI 130 course, it was decided to modify the order of the original survey and include three additional ethics questions. Consequently, the 1996 survey included the following questions:

1. A law firm has offered you a generous contract to help upgrade their information system. When you suggest that they need to upgrade their software, you discover that they have illegally copied software. How would you respond to this situation? : (1) Demand that all illegal software be removed. (2) Suggest that all illegal software be removed. (3) Refuse to work for them. (4) Report them to the Software Publishers Association. (5) Ignore the illegal software.
2. Assume your friend owns a disk that contains a program you are highly interested in. The disk is not copy protected (i.e., it can easily be copied to another disk), but it is copyrighted (i.e., it is sold by software vendors). Would you copy the disk if the price of the software were: (1) over \$250 (2) over \$100 (3) over \$50 (4) over \$25 (5) over \$5 (6) I would not copy the disk. [7]

3. You are contacted by a business to set up a computer system. The business buys software packages at your suggestion and you install them on their computer. Under what conditions do you feel it is appropriate to install the software on your own computer? : (1) Just while you are writing the programs for the business. (2) As long as you are maintaining the software for the business. (3) As long as you buy your own copies of the software. (4) I would not install it on my own computer.
4. Assume you have recently purchased a disk with software you need for your work. You paid \$250 for it. A friend of yours approaches you and asks to copy the disk. Would you (1) Agree (2) Agree but ask him or her to share the cost of the software (3) Not Agree. [7]
5. Assume you have recently bought a disk with game software on it (such as flight simulator). You paid \$25 for it. A friend of yours asks to copy the disk. Would you (1) Agree (2) Agree but ask him or her to share the cost of the software (3) Not Agree. [7]
6. Some software is referred to as shareware. It is neither copyrighted nor copy protected, but a new user is usually asked to send a contribution of \$10-\$50 to the author. Assume you have copied shareware that you consider unsophisticated, but useful. It seems that you use it occasionally. The author asked for a contribution, but did not specify any amount. Would you (1) Send nothing (2) \$1-5 (3) \$6-10 (4) \$11-20 (5) Over \$20. [7]
7. Assume you recently found a password de-encryption program on the Internet, would you: (1) Try it out on someone's account just to see how it works. (2) Use it to help a friend out who forgot his /her password. (3) Not use it at all.
8. Do you think software companies make (1) Huge profits (2) Large Profits (3) About average profit of other industries (4) Small profits. [7]
9. Software companies should have different prices (for the same software) for (1) corporate and governmental organizations, and (2) individual users: (1) Strongly Agree (2) Agree (3) Strongly Disagree (4) Disagree (5) Neither agree nor disagree. [7]
10. Society should deal with software as it does with books. Software should be available to users through software libraries, for a nominal fee: (1) Strongly Agree (2) Agree (3) Strongly Disagree (4) Disagree (5) Neither agree nor disagree. [7]

Results

In this study, questions 2, 4, and five were designed to measure the respondents' willingness to copy software illegally. Oz [7] used the cost of software as a distractor to get at the "real issue" of whether the students would copy software or not. The results contrasting the two groups are summarized in Table 1 below:

TABLE 1

Question 2: Would you copy software if it cost . . .

	1994 (No Ethics)	1996 (Ethics)
Would Copy	65%	67%
Would Not Copy	35%	33%

Question 4: Would you allow your \$250 program to be copied?

	1994 (No Ethics)	1996 (Ethics)
Would Copy	66%	68%
Would Not Copy	34%	32%

Question 5: Would you allow your \$25 program to be copied?

	1994 (No Ethics)	1996 (Ethics)
Would Copy	73%	72%
Would Not Copy	27%	28%

The null hypothesis tested was that there was no significant difference between the proportion of students who did not receive the formal ethics component and those who did receive the formal ethics component as part of the introductory computer science course, CSCI 130. In all three questions the null hypothesis was not rejected, i.e., the presence of the formal ethical component appears to make little or no difference in the respondents' answers to these questions.

Table 2 contrasts the results of the two groups willingness to pay the author of a useful shareware program for the software that is being used. In question 6, the null hypothesis is that there is no significant linear correlation between the responses provided by the two groups. In this case the null hypothesis is not rejected, i.e., there is not a statistical significant correlation between the two groups. This result is confirmed when is noted that those receiving the formal ethical component are more willing to pay higher rates for the shareware software, however, half this group would use the software and not pay the author at all.

TABLE 2

Question 6: What would you contribute for useful shareware?

	1994 (No Ethics)	1996 (Ethics)
Nothing	40%	50%
\$1-5	18%	4%
\$6-10	18%	28%
\$11-20	17%	12%
over \$20	7%	6%

Questions 8, 9, and 10 are used by Oz [7] to attempt to determine why the respondents would be willing to justify software piracy. The students in both groups were asked their opinions. As in the previous question, the null hypothesis for these questions is that there is no significant linear correlation between the two groups. The results are summarized in Table 3. The results for questions 9 and 10 show that the two groups' responses to these opinion questions were not linearly correlated. However, in both questions there were similarities. In question 9, 67% strongly agreed or agreed that software should be priced differently for organizations and individuals. In question 10, 78% and 64%, respectively, strongly agreed or agreed that software should be loaned like library books for a small fee. The null hypothesis was rejected in response to answers for question 8, i.e., both groups had similar responses as to the profits made by software companies.

TABLE 3

Question 8: What kind of profits do software companies make?

	1994 (No Ethics)	1996 (Ethics)
Huge	31%	33%
Large	39%	37%
Average	25%	29%
Small	5%	0%

Question 9: A software package should be priced differently for organizations and individuals . . .

	1994 (No Ethics)	1996 (Ethics)
Strongly Agree	36%	24%
Agree	31%	43%
Strongly Disagree	7%	2%
Disagree	17%	12%
Neither	9%	18%

TABLE 3 -Cont

Question 10: Software should be loaned like library books for a small fee . . .

	1994 (No Ethics)	1996 (Ethics)
Strongly Agree	36%	24%
Agree	42%	40%
Strongly Disagree	5%	2%
Disagree	9%	10%
Neither	8%	24%

Questions 1, 3, and 7 were included in the recent survey administered in the Fall of 1996 to the students receiving the formal ethical component. As noted in Table 4, in all three questions a majority of students who did receive the formal ethical component failed to respond with the ethical imperative.

TABLE 4

Question 1: You discover illegally copied software. How would you respond . . .

	1996 (Ethics)
Demand Illegal Software Be Removed	4%
Suggest Illegal Software Be Removed	71%
Refuse To Work	2%
Report To SPA	6%
Ignore Illegal Software	18%

Question 3: Under what conditions do you feel it is appropriate to install software on your own computer . . .

	1996 (Ethics)
While writing the Programs	10%
While Maintaining the Software	63%
Buy Your Own Copies of Software	18%
Would Not Install On My Computer	10%

Question 7: Use password de-encryption program found on Internet . . .

	1996 (Ethics)
Try It Out To See How It Works	30%
Use It To Find Forgotten Password	32%
Not Use It At All	38%

Conclusion

Obviously, the results strongly suggest that the formal ethics component introduced in the freshman year is having little impact on the students in the computer science program. It can be argued that the survey's primary emphasis was upon software piracy. Since computer ethics encompasses more than the issue of software piracy, the survey results are probably not an accurate measure of the students' ethical attitudes with respect to all ethical issues in computing. Johnson [4] suggests that courses on computer ethics "should have the following goals: (1) to make students . . . aware of ethical issues surrounding computers; (2) to heighten their sensitivity to ethical issues in the use of computers . . . ; (3) to give them more than a superficial understanding of the way in which computers . . . change society . . . ; (4) to provide conceptual tools and develop analytical skills . . . for ethical decision making." However, the results of the survey do show that at least in one measure of ethical behavior the methodology for teaching computer ethics is not working.

How should computer ethics be taught to computer science majors? One could require of all computer science majors a computer ethics course modeled after similar courses in business ethics which are required by many Business Schools. Accordingly, it could be debated as to whether such a course should be required at the freshman level, where, possibly, it could influence students' behavior throughout their academic career; or should a computer science ethics course be treated as a required capstone course affecting students who are about to enter the professional world. While often it is felt that beginning computer science students do not have the intellectual background or framework to adequately analyze ethical and social issues, Schulze & Grodzinsky [9] report that, from the very beginning, CS1 and CS2 students should be introduced to ethical and social issues as an integral part of the foundation courses. They take the position that "it is critical that students understand that irrespective of their viewpoint, ethical solutions must be consistent, coherent and defended with reason rather than emotion and intuition." [9]

Another area of concern is who should teach computer ethics? In many Business Schools, business ethics is taught out of the Philosophy Department. Johnson [4] in her article, "Who Should Teach Computer Ethics and Computers & Society?", advocates "it is best for philosophers trained in ethics . . . to teach . . . courses in computer ethics." She felt that in reality all ethical and professional issues dealing with computers have their antecedents in societal issues and ethics. Gotterbarn [3], in his response to Dr. Johnson's article, felt that computer scientists, as trained professionals, should teach computer ethics; "Who should teach computer ethics? I believe computer scientists are capable of learning the ethical theories and strategies . . . Given some training in ethical issues, provided by books, workshops, seminars, etc., they would be able to effectively include computer ethics in their classes." Responding to the question of how much training is necessary for computer scientists to effectively teach computer ethics, Werth [11] reports that computer ethics is an interdisciplinary study demanding "technical knowledge combined with a deep understanding of ethical and social principle and skills." Consequently, she argues that computer science faculty need to be trained to teach ethical and social issues.

In the September 1996 issue of *Computers & Society*, Riser & Gotterbarn [8] advocate that computer ethics should be taught across the computer science curriculum. They argued that " . . . the most effective ways to introduce ethics to computer science students is by the use of a variety of ethics activities in technical computer science courses taught by the regular computer science

faculty." The second report of Project ImpactCS [6] proposes that an expanded area of study in ethics be added to the curriculum. This area of study would be equivalent to a full course. The report also recommends that ethical and societal issues be integrated throughout the computer science curriculum. With this approach, ethical components are blended "seamlessly" in all classes throughout the major. Consequently there is a continuum of reinforcement, while stating for all concerned that ethics is something that computing professionals do on a regular basis.

Martin [5], in a National Science Foundation sponsored project, states that the two major problems "that hamper the implementation of an across-the-board curriculum" which integrates social and ethical topics in computer science courses is "the lack of materials that can be adopted or adapted into the existing CS curriculum and the lack of awareness and expertise on the part of most CS faculty." As a result of Martin's project, modules were developed to facilitate the teaching of ethics and faculty enhancement seminars were created to train computer science faculty to use these modules in topics throughout the computer science curriculum.

In conclusion, a one shot approach to computer ethics is not working at Coastal Carolina University. The formal ethics component implemented in the first computer science course required of all majors is important. However, the authors of this paper are in agreement with Riser & Gotterbarn [8] that ethics needs to be an integral component in all technical courses throughout the major. With this approach, computer science faculty are not faced with a dichotomy as to whether to sacrifice course concepts in lieu of teaching an artificial ethics component.

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The Web-Database Connection

Tools for Sharing Information on the Campus Intranet

Nancy E. Thibeault
Computer Services Manager
Miami University
4200 East University Blvd.
Middletown, OH 45042
phone: (513) 727-3355
fax: (513) 727-3223
thibeane@muohio.edu

Introduction

The World Wide Web (WWW, the Web) is growing rapidly. In a few short years, it has grown from a means of displaying static documents to a medium for sharing dynamic information. Unfortunately, most Web sites are not taking full advantage of the Web's dynamic information sharing capability.

Not long ago, adding dynamic content to your Web pages meant learning a CGI (Common Gateway Interface) programming language and writing custom scripts, a tedious and time-consuming process. All this has changed, new Web database tools have been developed that provide easy access to databases from Web pages. With these tools, you can create dynamic, data-driven Web sites, instead of static pages with fixed text and images. These tools allow the user to interact with the database through HTML forms. The user can retrieve, store, update, and delete data from the database using the Web interface. Simply update your database and the new information is immediately available on the Web. Using a Web browser interface to your databases provides your users with an easy-to-use, platform-independent interface.

This paper evaluates four tools for creating Web pages that interface with Microsoft Access databases: DB Gateway, Internet Database Assistant, Microsoft Internet Database Connector, and Cold Fusion. The system requirements and features of each tool are discussed. A sample application, "The Virtual Help Desk" demonstrates how to interact with a database using the four tools. Some of the tools include Wizards to assist you in your development efforts; however, you will need to become familiar with Hypertext Markup Language (HTML), including Forms and Tables, relational databases, and Structured Query Language (SQL). Some programming experience is also helpful.

Background

Miami University Middletown is a branch campus with approximately 2300 students, 75 full-time faculty members, 75 part-time faculty members and 150 full-time staff members. My department is responsible for all computer services on campus. I have 2.5 staff members and 15 student workers. We maintain a campus network consisting of 350 microcomputers (Windows '95, Windows 3.1, and Macintosh), five servers (Novell, Windows NT, LINUX, and two VMS), email

and an Internet connection. We are also responsible for supervising the computer center and five computer classrooms, providing faculty and student training, plus completing approximately 200 work orders per month.

For the past two years, I have used an Access database to track the work orders. All calls that could not be handled over the phone were recorded in the database and assigned to a worker. Work lists of open calls were printed daily for each worker. When jobs were completed the workers marked them on their lists then I would update the database. This system required a lot of my time and had several problems. Work requests would be phoned in, but would not be passed on, or would get lost before they were entered into the database. I normally updated work lists at the end of the day. It was difficult to keep the work lists current. After updating and printing the work lists, I often received additional work requests. I would add the new requests to the database and reprint the work lists. After the workers picked up their work lists, additional work requests would be received and the workers would not see the requests until I reprinted their lists, delaying the processing of the request.

In addition to my Computer Services duties, I am also required to teach one course per semester. In the fall of '96, instead of teaching one course for the entire semester, I covered three classes for the last five weeks of the semester while a faculty member went on maternity leave. My staff members were concerned that they would have the additional burden of maintaining the work lists while I was busy teaching, and asked me to try to automate the system. Using a Web interface seemed like a natural solution, so I began my search for products to create a Web interface to the existing Access database. The result was the Virtual Help Desk. Users can add and update work orders, print work lists, and check the status of work orders via the Web interface.

The Virtual Help Desk was initially written using DB Gateway then rewritten in Cold Fusion. It is currently only used by the Computer Center staff and student workers, but will be made available campus wide in the fall. This system has saved me a lot of time and headaches. The workers really like using the system. They can enter new work orders and check their work lists from anywhere. They can even dial up from home. I still handle the task of updating the status of the work orders, the workers would like to do this themselves; however, my definition of "Job Completed" is often different from theirs.

The Database Format

The Virtual Help Desk database consists of two main tables, Directory and NewWork. A unique ID field (EmpID) links the two tables. The Directory table includes an entry for every faculty member, staff member and computer classroom. The NewWork table contains the associated work orders. A third table, Workers, contains the names of the current Computer Center staff and student workers.

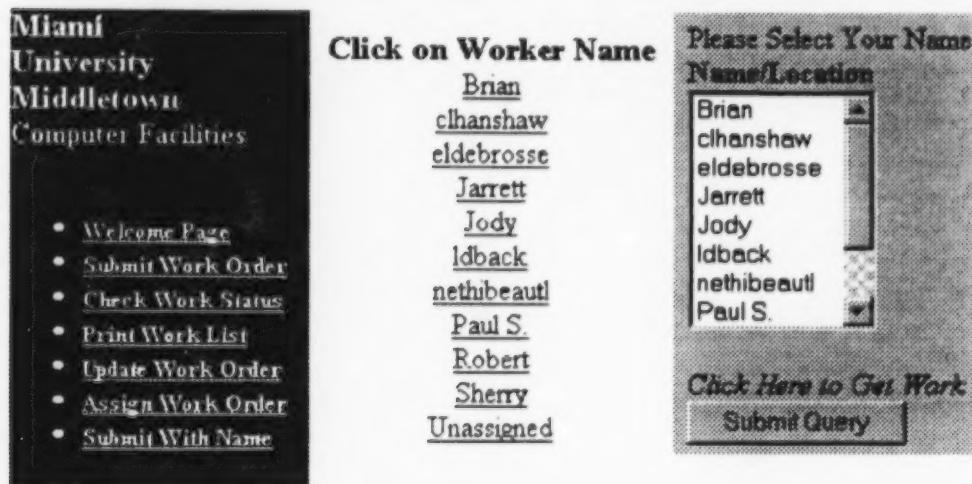
Directory	NewWork	Workers
EmplID	EmplID	WorkerID
LastName	Date	WorkerNm
FirstName	Problem	
Department	DueDate	
Bldg	AssignedTo	
Room	Status	
Phone	CompletionDate	
	RefNum	

The Web Interface

The current interface uses frames. The smaller frame contains the menu and is always visible. The larger frame is used to show the results of selecting a menu option.

Figure 1 shows the menu and the results of selecting the "Print Work List" option. Two different methods are shown. I initially used a selection list and submit button, but later changed to using the name as a hyperlink to make it easier for the user.

Figure 1. Virtual Help Desk Menu showing two different methods for "Print Work List"



When "Print Work List" is selected from the menu, the list of worker names appears in the larger frame. The user clicks on a name (and the submit button if using selection list), then the work list appears in the larger frame. Figure 2 shows a sample work list.

Figure 2. Sample Work List

Brian's Work List For Sun March 23, 1997

LastName	Office	Phone	Date	RefNum
Schubert	114 JH	217	11/6/96	2250
She selects Start Find File then gets illegal operation error and computer shuts down.				
Capo	205 TH	266	11/6/96	2247
Computer still locking up intermittently - called back into Dell 11/6/96 - wants us to call back from machine - Brian removed cache - goes fast and slow when in screen saver (even after removing the cache). Marlene wil let us know if it locks up. If we haven't heard from her by Wed call back to Dell. When jerks, colors fade.				
Johnson	114 JH	117	11/11/96	2272
Reinstall Reflections on all the admissions machines except Dave's and Mary Lu's (it works on theirs, but not on the others).				
Lynch	213 JH	259	11/13/96	2289
Install multimedia kit in her computer - kit in Nancy's office				

The Web Database Tools

SQL is used to communicate with relational databases. HTML does not support embedded SQL; however, the Web database tools add this capability. The embedded SQL is interpreted by the tool, which formulates a query, contacts the database, collates the query results and presents the results to the user in an HTML document.

The system requirements and functions are shown in Figure 3. In the following sections, I show a sample of the files and the code needed by each tool to select an employee and print a work list.

Figure 3. System Requirements for Web Database Tools

Tool	Operating System	Web Server	Supported Databases	Method	Functions
DB Gateway	Windows '95 Windows NT	O'Reilly's WebSite Netscape Enterprise Server	Microsoft Access Microsoft FoxPro	Embed SQL queries in hidden Form elements	Queries Add record
Inranet 2001 IDBA		Not needed	ODBC	Embed SQL queries in comments	Any SQL query
Microsoft IDC	Windows NT	IIS	ODBC	.IDC and .HTX files	Any SQL query
Cold Fusion	Windows '95 Windows NT	IIS	ODBC	Cold Fusion Mark Up Language	SQL queries plus its own programming language

DB Gateway

Initially, I searched for freeware. The first product, I experimented with was DB Gateway. DB Gateway is a CGI application that provides World Wide Web access to Microsoft Access and FoxPro databases. It was developed by Computer Systems Development Corporation. It is available for download at [VARIABLE\({\fs24 HYPERLINK http://fcim1.csdc.com/DBGate/dbintro.htm }\)](http://fcim1.csdc.com/DBGate/dbintro.htm)

I used DB Gateway to implement my first version of the Virtual Help Desk. This version was created in two weekends. We used this version for three months. The Web interface was only used to add new work orders and print work lists. The Access database interface continued to be used for work order assignment and update. This system was fairly primitive, but it achieved the goal of allowing the workers to enter work orders and print work lists.

DB Gateway uses hidden HTML form elements to build the SQL queries and report templates to display the results of the query. The WKLIST code below includes the hidden HTML form elements that will be used to generate the SQL query to select the WorkerIDs and WorkerNms from the Workers table. When the user clicks on the "Print Work" option, the SQL query is sent to DB Gateway, where it is processed. The result of the query is displayed using the indicated report template, PRINTWK.

```
<FORM METHOD="POST" ACTION="/cgi-win/dbgate.exe">
<INPUT type=hidden name="ACTION" value="SubmitExternalQuery">
<INPUT type=hidden name="DBNAME" value="MUMCCDB">
<INPUT type=hidden name="DBTYPE" value="ACCESS">
<INPUT type=hidden name="QUERYNAME" value="WorkList">
<INPUT type=hidden name="DBACTION" value="Query">
<INPUT type=hidden name="FIELDS0" value="WorkerID, WorkerNm">
<INPUT type=hidden name="FROM0" value="Workers">
<INPUT type=hidden name="ORDERBY0" value="WorkerNm">
<INPUT type=hidden name="REPORTNAME" value="PRINTWK">
<INPUT type="image" name="" Src="/print.gif">
</FORM>
```

The PRINTWK report template below displays a selection list of worker names that were generated from the WKLIST code above. PRINTWK also formulates the query to print the work list for the selected worker. The SQL query in PRINTWK uses an enumerated name designation that splits the WHERE clause into three hidden form variables, WHERE0, WHERE1, and WHERE2. DB Gateway will concatenate the various parts into sequential order to form the SQL statement.

```
<INPUT type="hidden" name="FIELDS0" value="RefNum, Date, LastName, Problem">
<INPUT type="hidden" name="FROM0" value="Directory, NewWork, Workers">
<INPUT type="hidden" name="WHERE0" value="WorkerNm = AssignedTo and Status =
'Waiting' and Directory.EmpID = NewWork.EmpID and '>
```

```
<INPUT type="hidden" name="WHERE1" value=WorkerID = ">  
<SELECT NAME="WHERE2" >  
<OPTION VALUE=" <FIELD NAME="WorkerID"> <FIELD NAME="WorkerNm">  
</SELECT>
```

When the user selects a name from the list and clicks the submit button, DB Gateway formulates the SQL query, sends the query to the Access database, then displays the result using a default format. I could have defined another report template, but elected to use the default.

Internet Database Assistant

Internet Database Assistant (IDBA) is a product of Intranet 2001, Inc. It provides SQL access to any ODBC data sources from your Web page. The freeware version is available for download at <http://www.inet2001.com>. There is also a commercial version, which was not investigated. IDBA does not require a Web server.

IDBA is an improvement over DB Gateway. IDBA queries appear as embedded comments in the same HTML form where they are used. IDBA is much simpler than DB Gateway, I rewrote the Virtual Help Desk using IDBA in an afternoon. We never used this implementation, because I went on to discover a product that I liked better.

The code below queries the database and displays the selection list of worker names. Comments are used to send the queries to IDBA, form variables are preceded with a v (i.e. vWorkerNm). The code below performs the same operations as DB Gateway's WKLIST and PRINTWK combined. Both the query and the results can be processed in the same file. When the form is loaded, IDBA sends the query to the database and then displays the results using the format indicated in the TYPE statement. The user then selects a name from the selection list and clicks the submit button. The selected name is passed to the page indicated in the form action, which prints the work list for the selected worker.

```
<FORM METHOD=POST ACTION="PrintWork.htm">  
Please Select a Worker:  
<!--Query::DSN=MUMHelpDesk::  
SQL=Select WorkerNm from Workers::  
TYPE=SELECT(vWorkerNm)::  
<INPUT TYPE="SUBMIT"><INPUT TYPE="RESET">::  
</FORM>
```

The PrintWork.htm file shown below will display the table of work orders for the selected name. The default template in DB Gateway handled this. When the page is loaded, vWorkerNm is replaced by the selected worker's name, the query is sent to the database, then the resulting data is displayed in table format.

```
The Work Orders for <STRONG>VAR(vWorkerNm)</STRONG> are:<BR>  
<!--Query::DSN=MUMHelpDesk::
```

```
SQL=SELECT DISTINCTROW Directory.LastName, NewWork.Problem,
NewWork.DueDate, NewWork.RefNum
FROM Directory RIGHT JOIN NewWork ON Directory.EmpID=NewWork.EmpID
WHERE NewWork.WorkerNm=VARQ(vWorkerNm)
AND NewWork.Status='Waiting':TYPE=TABLE:END>
```

Microsoft Internet Database Connector

The Microsoft Internet Database Connector (IDC) is a component of the Microsoft Internet Information Server (IIS). It requires Microsoft Windows NT Server 3.51 or higher. IDC uses two file types to interact with the database, .idc and .htx (HTML extension). The .idc file contains the information needed to execute the query against the database. The companion .htx file is used to format the data returned from the SQL query contained in the .idc file. The .idc file can be invoked from a hyperlink or form action. When the .idc file is requested, IDC formats the queries and sends them to the ODBC data source where the queries execute. IDC returns the result to the .htx file, which displays the result on the user's browser. Microsoft Access '97 and the IIS Add-In for Microsoft Access '95 automatically generate the .html, .idc and .htx files needed to query the database. The developer can quickly and easily generate the files to query the database, then customize them as needed.

IDC requires four files to select a worker and print the work list:

GetWorkers.idc is activated when the user selects the "Print Work Orders" menu option. The .idc file sends the query to the indicated data source. The data returned from the query is then passed to the indicated template, GetWorkers.htx.

```
DataSource: MUMHelpDesk
Template: GetWorkers.htx
SQLStatement:
+SELECT WorkerNm
+FROM Workers
```

The <%BeginDetail%>...<%EndDetail%> section in the GetWorkers.htx file below contains the placeholders for the data returned from GetWorker.idc. The placeholders use the syntax <%filename%>. The code below displays the worker names in a selection list. The user selects a name, clicks the submit button, and the form action invokes GetWorkList.idc.

```
<FORM METHOD="POST" ACTION="GetWorkList.idc">
SelectWorker:
<SELECT NAME="WorkerNm">
<%BeginDetail%>
<OPTION><%WorkerNm%>
<%EndDetail%>
</SELECT>
</FORM>
```


GetWorkList idc sends a query to the data source to select the work list for the selected worker. The query results are passed on to WorkRpt.htx indicated by the template field.

```
DataSource: MUMHelpDesk
Template: WorkRpt.htx
Required Parameters: WorkerNm
SQLStatement:
+SELECT NewWork.RefNum, NewWork.Date, Directory.LastName,
NewWork.Problem
+FROM Directory Right Join NewWork On Directory.EmpID = NewWork.EmpID
+WHERE NewWork.AssignedTo = '%WorkerNm%' AND NewWork.Status = 'Waiting'
```

WorkRpt.htx displays the work list for the selected worker.

```
<TABLE>
<%BeginDetail%>
<TR>
<TD><%RefNum%></TD><TD><%Date%></TD><TD><%LastName%></TD>
<TD><%Problem%></TD>
</TR>
<%EndDetail%>
</TABLE>
```

Cold Fusion

Cold Fusion is a commercial product available from Allaire Corporation. A 30-day evaluation copy can be downloaded from <http://www.allaire.com>. A single user version is included in the Cold Fusion Web Database Construction Kit (see references). Cold Fusion can run under Windows NT IIS, Windows '95 using O'Reilly's WebSite, or any Web server that supports CGI.

Cold Fusion applications are built by combining HTML with Cold Fusion Markup Language (CFML). Cold Fusion tags begin with <CF ...>. Cold Fusion variables, functions and expressions are enclosed within # .. #. CFML uses SQL to access ODBC data sources. All pages that use Cold Fusion have a .cfm extension. When the server receives a request for a .cfm page, it is sent to Cold Fusion, which formulates the queries and sends the queries to the data source. Cold Fusion uses the query results to translate the .cfm file into HTML. The resulting page is then forwarded to the requesting client.

The GetWorker.cfm code below displays links to work lists based on worker names. When the page is loaded, Cold Fusion sends the query to the data source. #WorkerNm# is replaced with the values returned from the query, displaying links for each of the worker names.

```
<CFQUERY NAME="GetWorkers" DATASOURCE="CCHelpDesk">
SELECT * FROM Workers
```

```

ORDER BY WorkerNm ASC
</CFQUERY>
<CFOUTPUT QUERY="GetWorkers">
<TR><TD>
<A HREF="PrintWorkList.cfm?WorkerName=#WorkerNm#">#WorkerNm#</A><BR>
</TD></TR>
</CFOUTPUT>

```

When PrintWorkList.cfm is invoked, it is passed the worker name (#WorkerNm#) as a URL parameter. When the page is loaded, the query uses the worker name to select the work list from the database. The data returned from the query is then printed in table format.

```

<CFQUERY NAME="GetWorkList" DATASOURCE="CCHelpDesk">
SELECT * FROM NewWork, Directory
WHERE Status='Waiting' AND Directory.EmpID = NewWork.EmpID
AND NewWork.AssignedTo = '#WorkerName#'
ORDER BY Date ASC
</CFQUERY>
<TABLE>
<CFOUTPUT QUERY="GetWorkList">
<TR><TD>#LastName#</TD><TD>#Room# #Bldg#</TD><TD>#Phone#</TD>
<TD>#DateFormat("#Date#", 'm/d/yy')#</TD><TD>#RefNum#</TD></TR>
<TR><TD COLSPAN=5>#Problem#<HR></TD></TR>
</CFOUTPUT>
</TABLE>

```

Conclusions

DB Gateway is too limited and too complex to be a useful tool. If you want a free product and do not have Windows NT server, IDBA looks like an acceptable alternative. If you already own Windows NT server, I recommend that you consider IDC. Even with the disadvantage of the file organization, IDC is worth further investigation. It is still fairly straightforward and has the added benefit of the Access IIS Add-In to automatically generate your .idc and .htx files. Cold Fusion is worth the investment if you need a Web programming development language. The features of the four tools are summarized in Figure 4.

Once I discovered Cold Fusion, I became addicted. I added many features to the Virtual Help Desk, and went on to find new applications. I implemented a numeric base conversion page for my Computer Architecture class. It uses built in Cold Fusion functions to randomly generate problems and solutions, then grade the students' answers. This gives the students much needed extra practice. I also created a multiple choice quiz generator. The user enters questions, answers and choices into an Access database, then the Quiz.cfm pages present the questions to the user, grade the quiz, and record the results in a database.

I am developing a course in World Wide Web programming for fall '97 which will provide me and my students with the opportunity to investigate additional tools.

Figure 4 Summary of the features of the four tools.

Features	DB Gateway	IDBA	IDC	Cold Fusion
Free	X	X	Win NT	\$500
Technical Support				X
Reference Material			X	X
ODBC data source		X	X	X
All SQL supported		X	X	X
Queries and results in same page		X		X
If-Else construct			X	X
Any HTML output format	X		X	X
Convenient file location		X	X	X
Complete development environment				X
Wizard			X	X

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<http://www.microsoft.com/Accessdev/TTK/AIReadMe.htm>

Job Forum: A Sample Internet Information Server Application that Stores and Retrieves Data from a Microsoft Access Database (1996)
<http://www.microsoft.com>

Microsoft Internet Information Server Overview for Reviewers (1996)
<http://www.microsoft.com>

PC Products for Accessing a Database Server via the World Wide Web
http://cscsun1.larc.nasa.gov/~beowulf/db/pc_products.html

MIS On-Line

Nancy S. Thomson
DonnaRose Echeverria
Bob Mills

Computer Science/Information Systems Department
Northwest Missouri State University
Maryville, MO 64468
(816) 562-1766

thomson@acad.nwmissouri.edu
0201021@acad.nwmissouri.edu
0237067@acad.nwmissouri.edu

Introduction

The concepts generally taught in an introductory Management Information Systems course include technologies like the World Wide Web, operating systems, and other business related software. This course was designed to utilize as many of these technologies as possible to redefine the teaching/learning paradigm. Using these technologies to produce the content and setting up the classroom environment requiring the use of them to retrieve and learn the concepts allows the student greater control and flexibility in their learning processes. The teacher's role becomes one of mentor, guide, or coach to help the student negotiate the learning process. Thus, in the MIS course, this methodology becomes both the means and the ends to the learning activity.

Development of this paradigm shift is a daunting task in a variety of ways. It requires the redefinition of roles for both students and faculty. A tremendous amount of time and resources to acquire, negotiate, develop, build and disseminate must be available. And most importantly, it requires a team to produce and define the process and outcomes. This paper describes those resources, processes and outcomes in an attempt to share what we have learned with others who may wish to embark on a similar journey.

Rethinking the paradigm

Redefining the role of the faculty member from "sage on the stage" to "guide on the side" requires both the faculty member and the student to reassess their roles and responsibilities in unfamiliar terms. The locus of power which has been held by the faculty member is often hard to give up for both groups. There is a position of esteem and an expectation of decision making that has a long established hierarchical tradition. To move the student into the game as a learning team member with the faculty as mentor or coach requires new commitments and understanding of expectations from each. Some students view this shift as the faculty member "abdicating" their assigned role. Some faculty refuse to give up that position of power for the one of facilitator. This experience has shown this to be true and a difficult obstacle to effectively handle.

For the undergraduate student whose concerns are more closely geared to personal needs and professional goals—graduating and getting a job—they do not often take kindly to such a diverse “opportunity” for learning how to learn differently. They have become accustomed to the traditional model which often requires little more of them than listening and regurgitation. It is a simple, efficient method for handling large numbers of students. The student can usually be as visible or invisible in this type of environment as they choose depending upon their level of desire and interest. The new paradigm does not allow them this type of anonymity. Instead, it requires attention to both the process of learning and the content to be digested. The student must glean information, assess its value, organize its content, and relate it to other media. Trying to accomplish this in one semester in one class when the rest of the world operates in the traditional mode has proven to be quite challenging to most undergraduate students. A significant amount of time was required to gain acceptance and build confidence. Much discussion about process and less discussion on content became the norm during the class time.

This model for implementing the paradigm shift requires significant levels of technology and access. The Northwest campus is fortunate to have had since 1987 several microcomputer labs, computers in each residence hall room and faculty office, and several classrooms equipped with multimedia teacher stations and computer ports for desktops or laptops. Students are exposed to computing technology from their first appearance on campus and are expected to become computer literate quickly. However, it was discovered through this research process that exposure and literacy clearly do not imply proficiency or competency. Part of this is due to the fact that the technology changes so rapidly. Most of the students who learned well as in-coming freshman found that by the time they took MIS their skills were no longer current. For example, when the students in the junior/senior level MIS course took computer literacy they were using Windows 3.1 and there was no access or real knowledge about the Web. Much time had to be devoted to updating their skills and building current computing proficiency.

Technology and Interactive Content

The MIS-Online project encompasses the available campus technology including microcomputers with Windows 95 and Office 95, access to the World Wide Web via Netscape, and local VAX services providing e-mail, and personal accounts. The textbook chosen also provides a CD containing the complete text plus a summary version with additional items such as videos and audio supplements as well as quizzes and interactive practice exercises. Students can check out the CD from the instructor. Many students have their own computers and there are several labs on campus with CD-ROM capability. Audio and video output is usually not allowed in computer labs without headphones.

Students receive information and some class instruction via e-mail and are required to communicate with the instructor via E-mail. Northwest has an extensive local area network with terminals in every dorm room and dial-up connections. In addition, students are required to utilize the local Windows95 network using Network Neighborhood. Various class materials are posted to the server by the instructor. The client/server network makes these resources accessible anywhere on campus. Off-campus students have access to these resources if they have appropriate modem and software capabilities on their home computers.

Finally, students are required to utilize the MIS web site that has been developed by the project team. An attempt has been made to make the web site one of the focal points of information gathering for the class. The web site is laid out similar to the book, with chapters as the major sections. Each chapter selection of the web site has the following choices:

Objectives - Students can read what is expected of them for each chapter.

Notes - Students can access chapter outlines.

Slideshow - Students can view Powerpoint presentations from prior classes.

Those deemed to be most effective by the instructor are placed on the web site.

Internet Connection - Students can link to the Prentice Hall site for additional supplementary information and online cases.

Articles - Students can access relevant Wall Street Journal articles

FAQ - Students can view some of the most frequently asked questions and their corresponding answers.

Quiz - Students can take a 10 question self-check using a Java applet.

Hotlinks - Students can access sites that are relevant to the chapter .

In addition, students can access the syllabus for any section, report guidelines, files they need for lab exercises, and other related content. A weekly banner message is posted to the home page of the web site. This message usually refers to upcoming tests and projects.

The web site is hosted on the Northwest server which uses a VAX VMS operating system. Given the relative obscurity of navigating in this system, several Windows applications have been developed in Java to automate the tasks of updating the web site. This facilitates the maintenance and information modification.

Development

The project began during the 1995-96 academic year when the project team consisting of the faculty member, graduate student, and undergraduate student began studying on-line delivery of courses. Two sites were found to have advanced use of on-line courses. The team visited the University of Illinois Champaign-Urbana where the physics department had utilized an on-line method of administering tests and disseminating class information. Using a UNIX-based system, they had developed a comprehensive web site for the entry-level physics class of approximately 1500 students.

In January of 1996, the team visited the West Point Military Academy in West Point, New York. At the academy, the Computer Science department had developed a comprehensive web site, the model of which was being used campus wide. Students could access class information, view past projects, and take tests on-line. This model was selected as their technology was similar to Northwest's and curriculum would be easier to convert using this model.

During the summer of 1996, development began on the MIS Web site. Using various HTML editors and graphics programs available on the Internet, the first five chapters were developed. In addition, since an on-line quizzing system was to be included a study of Java-related information available at the time was begun.

During the fall of 1996, web site development expanded rapidly. The project team grew to seven with undergraduate students providing assistance ranging from editing and proofreading to coding and implementation. All 19 chapters were completed with the addition of FAQs, Wall Street Journal articles, Powerpoint slideshows, and a prototype quiz. A password protection was added to the site, due to the use of proprietary materials located therein.

During Spring 1997, a complete overhaul of the site was done, making it more user friendly. Several Java-based applications were added to automate some of the web site updating tasks. The instructor no longer had to navigate through the VMS system, he/she only had to use a very simple, familiar Windows interface. The use of a quiz system for a portion of the class is being developed.

Maintenance

The team has found maintenance of the web site, and of the MIS on-line curriculum in general, to be very time consuming. The instructor oversees development of on-line curriculum, a graduate student handles administrative and coordination duties and assists with development of on-line curriculum, and four undergraduate students continually work on development and updating of the web site, audio/video materials, the quizzing system, and Wall Street Journal articles and hot links. The team also encountered the typical problems of a complex project: communication among team members was limited, and a lack of documentation was prevalent.

During the current semester, the project team works an average of 70 hours per week. The project team has increased its productivity dramatically through a better system of communication and documentation. Another Undergraduate student joined the team for 10 hours a week to do any coding tasks that were needed. This allowed other members to focus on strategic development of the system. In addition, documentation procedures were outlined, which greatly enhanced the project's comprehensiveness.

Overall, the needs of the project have dictated the massive amount of time for maintenance. The team has found it is essential that enough people with varied talents put a consistent amount of time into the project. Otherwise, the project remains stagnant and technology passes it up.

Learning

Even for those few students who are familiar with the subject of Management Information Systems, learning to learn in a totally new classroom environment has been found to be rather daunting for most students. Generally, students are comfortable with the lecture-text-test format of a university course. It may or may not be the best way in which they learn, but it is the traditional classroom format and most students have managed to make that system work for them. Trying to change those deeply ingrained behaviors does not happen quickly or painlessly for either the student or the faculty member.

More time than was initially anticipated was needed to reduce the earlier learned behavior and create an acceptance of the new methods. Much more resistance was encountered and much less excitement was generated as students perceived these new methods to be multiplying their work loads rather than giving them control over the learning process. Class time had to be spent in talking

about learning styles, presenting the components available, and showing their interrelationships. Students perceived that this class would be "hard" because they were moved into a learning environment unlike any other in their past or present college experience.

Accepting the fact that they had more control meant accepting a broader responsibility for their own learning and blasted the old paradigm—you teach, I learn. The new paradigm—you show me, I select, evaluate, and control my learning process is a scary scene for most young college students. They have trusted the "sage" to give a limited amount of information and gear them to precision learning.

Unfreezing

So how do we as educators facilitate the simultaneous learning of subject while re-learning the process? By offering the student a share in both the material and the manner in which it is presented. Even for the media enthusiast, this means study habits must be re-evaluated and re-learned in order to master the new technology in the classroom. What is important? What comes first? How do I learn the media and the subject all at the same time? How will I be graded/evaluated? These are questions that students ask, and questions they must have answered before they can adapt their own process of learning to suit the situation. This implies, of course, that there is a willingness to relearn these "comfortable" behaviors.

In an on-line course, the same material, the core of the subject, is presented in many different forms. For the student, especially at first, it all looks different. "Overwhelmed" is a word frequently heard in the first weeks of class. Therefore, an important first step is the introduction of the different elements as just that, different elements of the same course; similar or related material presented in multiple formats. A student learns to view multi-media as welcome alternatives, not additional requirements. This requires an un-freezing of the traditional definition of learning. Yes, a text is required. So is attendance in class, e-mail, use of the course Web site, Power Point, audio, video, and taking notes. But these are all inter-related through subject matter presented in different formats, not a collection of formats presenting unrelated material. The question now facing the student is not what to study, but where to begin, and where to concentrate.

Refreezing

Perhaps the easiest way to make this new environment work for the class is to let each student make the crucial decision of how to approach the course material by individually working through the formats in which a module is presented. At first, the sheer volume of the media can indeed appear overwhelming, but soon one distinguishes the similarity among the concepts presented in class, in the text, and on the Web site. Terms used in discussion and concepts outlined in class are also reviewed via audio, CD-ROM, multi-media activities, and applied to real life situations in video clips. Recent news items as well as hot-links to sites which put into practice the concepts discussed in the module serve to bring the subject matter to life. The student is thus faced with the easier-to-digest job of ranking these different applications in order of personal preference.

A student who does not learn easily from reading a textbook has alternatives, reinforcements and interpretations of the subject matter through a variety of options. For those who do not take notes

well in class, Power Point lecture outlines can be an excellent source for review, and downloading the text onto disk prior to class provides an easy outline which utilizes the personal computer in the classroom. If time permits, students should be encouraged to participate in an evaluation of learning styles. These tests are generally based on the Felder five-dimension model of learning and are available through many testing sources.

Costs

With such a unique course providing so many benefits to the learning process, why aren't these sections overflowing with prospective students? Because there is a direct relationship between the cost to the student and the benefit thereof. Cost here refers not only to the financial aspect but also to a serious time commitment. It is of immense benefit to the student to have a computer at home with Internet access so the Web site is available whenever needed. This implies that a relatively fast modem be used to minimize downtime in connecting to sites and downloading information. High speed, high density formatted disks are a necessity, and CD-ROM access highly desirable. Of course, a good quality sound card and high resolution monitor only add to the sensory stimulation of the presentation, which aids in long-term memory storage.

But the highest cost of the course is less readily measurable, that of time. In order to sort through all the available information, prepare for class discussion and note-taking adequately and utilize the on-line quizzes, one must prepare ahead, and then review. This all takes time, and not every student is dedicated enough to their own education to put that kind of time into the learning process. Some would even feel they made the wrong choice by not taking a more comfortable class which uses the traditional methods—their opportunity cost appears quite high.

Benefits

And what happens to student motivation on those days when the web is down, modem lines are jammed, and yes, the computer ate my disk with all my notes on it. In a way, this is preparation for the business world. In real life, the hard drive crashes, e-mail can't be accessed, and carefully prepared presentations are not compatible with conference room equipment. It is better to have experienced all this in the relatively safe classroom environment, where group discussions can solve at least some of the problems. The costs of invested time, both from the aspect of student preparation and on-the-spot problem-solving due to non-functioning technology translate into long term benefits. A student who has used a variety of technology in the class, from note-taking onto a disk to designing a web page, is truly prepared for technology in the business world. Thus an important part of student learning becomes utilization of the classroom technology on a personal level.

Many electronic courses today assume students are adept enough in computer technology to make it a part of their daily classroom habits. Our work with students enrolled in the MIS On-line course has proven otherwise. Although all students enrolled in the University must take a basic "Using Computers" class, and all residence hall rooms are outfitted with computers, not everyone proves able (or, perhaps willing) to immediately utilize what they have learned. The first class invariably becomes a lesson not in MIS, but in computer skills, turning the machine on and off, setting up screens for multi-tasking, sizing a note-pad for on-screen use. The lost time is made up

later in the term when students are able to move at their own pace.

We begin with an introduction to the equipment and software. While everyone may be familiar with the basic computer, they all seem to have the "on" switch in a different place and a quick walk-through eases student tension. A few experienced assistants circulating through the classroom is important at this stage of the process as students try to become comfortable with computer use. In the second class meeting, we do not assume that anything the students accomplished in the previous meeting has become an acquired skill. The class walks through the steps for setting up the screens and opening programs. We expected fewer problems than we actually had—there was much more learning and relearning as well as troubleshooting. Disks were not formatted, the mouse jerked, files "disappeared", things we never thought possible and for which there was no real explanation happened. Each error became a lesson in classroom computing and an opportunity to teach. Errors can be shared in a positive manner as a learning "experience" and students will begin to understand they are thinking about their learning PROCESS and well as the content. They also build confidence in their competence when they can tell someone else what they found out—even though it may have been only a few minutes earlier!

We also make a point of showing the class how those fancy slides projected in class can be converted to a learning tool, a permanent outline of the lesson. In the time it takes to demonstrate re-sizing the text and adding personal notes to the file, students begin transferring old pen-and-pencil skills to the new media. The first time the class explores the Internet usually turns quickly into a "fun" time as students find interesting sites and what they call "cool stuff out there." They are then shown how to view, bookmark, and download information to a floppy disk. They also see that the tool they are using is what people all over the world are also using and their home university is just as strong a presence in this electronic world as any other place or entity.

Student work becomes part of the legacy system of the course. Later in the semester they are given projects to develop in multi-media which relate to the weaknesses of the course content or delivery. The best work is included in the web site for future classes. A sense of ownership over the course material goes a long way toward removing the technological timidity of some students. The chance to leave their name and something behind to improve the quality of what is learned keeps interest active in both the subject and review of previous items. They also relook at the quality of the content and critically analyze both it and the processes in order to select and justify an appropriate topic.

Outcomes and Lessons Learned .

Some of the most important lessons realized through this development process were the importance of the team approach and the need for clear and complete documentation of all system components. Each team member contributed specialized knowledge and accepted specific responsibility for tasks such as site development, evaluation of course materials, assisting in class learning, assessing understanding, writing software, contacting publishers, designing layouts and many more.

Confusion became evident as the project became more complex and more components were in place. Inconsistencies were found as updates were made and one team member assumed primary

responsibility for re-establishing continuity and consistency throughout the web site. The master documentation notebook became the mainstay of the communication interaction of team members and progress tracking. Weekly staff meetings with agendas and minutes helped tremendously to guide the later development at the more complex stages.

We have learned not to expect everyone to take to multi-media learning like a duck to water. Just as there are students who do not learn easily from a lecture-and-text format, there will be those who do not adapt well to technology. If we measure success not by what the class is currently doing, but by how far they progress toward acceptance and use of an alternative learning environment in the span of the term, we hope we have an accurate measure of achievement. Removing computer fears and phobias and replacing them with knowledgeable technology users who view the tool as a vehicle rather than an end will hopefully translate into an attitude of quality lifelong learning.

Society is fast moving away from paper and pen and into computerized record-keeping of all sorts. Already more material is available to the student via computer than is readily accessible in the printed word, and the technological field is still growing. When a college course is introduced in which the traditional boundaries of lecture notes, textbook readings, and written tests are removed and material appears in very new and different forms, it is truly imitating today's business world. The student who masters this new process of learning will not only do well in class, but will be best prepared for the business environment of the future.

Notes

"Hitting the Books at a Virtual Campus," Business Week, 11 November 1996, 10.

See MIS Course Site, <www.nwmissouri.edu/~0500460>

Dr. Sylvia Charp, "Multiple Media for the Classroom & Media Center," T.H.E. Journal, February, 1997, 6.

Dr. Carl Smith, "Pursuing the American Cultural Imagination," Educators' Tech Exchange, Winter 1994, 21, arrived at similar conclusions in a multi-media humanities application.

Dr. J. Raymond Albrektson, "Mentored Online Seminar: A Model for Graduate-Level Distance," T.H.E. Journal, October 1995, 104, also discussed the need for student participation.

Barry Richmond, "Simulating the Business Experience," in Teaching Materials, Harvard Business School Publishing, Fall 1996. 3. Business simulations are a core feature of the MBA curricula.

"Teaching the 'Net without a Net: Custom Simulations Boost Freshmen's PC Skills," T.H.E. Journal February 1997, Vol. 24, no. 7, p 87-91. Note the assumption made regarding student computer knowledge.

New Zealand Education study completed by Learning Enhancement Associates (NZ) Ltd.
<<http://www.lea.co.nz/whoisl-1/leainfo.htm>>

Integrating a Computerized Testing System and Electronic Lecture Notes in First-year Mathematics Courses

Ray Treadway
Department of Mathematics and Computer Science
Director of Academic Computing
Bennett College
900 E. Washington Ave.
Greensboro, NC 27401
(910) 370-8739
rayt@pals.guilford.edu

The integration of test-banks for computer-based testing, textbooks, and electronic lecture notes in first-year mathematics courses has changed the way mathematics is taught at Bennett College. Classes meet in two electronic classrooms each with 27 computers on a local area network and a projection system. An integrated computerized instructional system (ICISS) has been set up in both labs so that a variety of teaching/learning approaches can be used. The main objective of the system is to involve students in the learning process by avoiding excessive writing on the board, providing information in an interactive mode, and allowing students to explore some concepts through computer software. At Bennett the system has been used in varying degrees in courses in Elementary Algebra, Intermediate Algebra, Pre-Calculus, and three semesters of Calculus.

Integrated Computerized Instructional Support System

The Integrated Computerized Instructional Support System was developed by Dr. Man Sharma, the Director of Academic Computing at Clark-Atlanta University. This project has been supported by several grants from the US Department of Education through the Minority Science Improvement Program. Materials are distributed by EDUCO International, Inc. of McDonough GA. Approximately 100 institutions are using or have used these materials. Bennett College has been involved with the ICISS project since 1988.

Question Banks and the Graphics Editor

The first component of the system is a set of extensive test-banks for each course. Most of the questions have hints and solutions so that students can use the test-banks for tutorials outside class or they can be used for short timed quizzes during the class period. Such frequent short quizzes are particularly useful in elementary algebra where quick recall of facts and procedures are tested. Students who do not do well on the first try may be allowed to make up the quiz at the discretion of the instructor. The questions banks have been installed on the network and records of the students' scores on quizzes are kept in "result" files. The instructor can also generate multiple versions of the test to be printed out and used as hard-copy tests. A graphics editor (MEDIT.EXE) with many mathematical symbols available is used to add questions or modify questions in the test-banks.

File Management and the Test / Menu Generator

The ICISS system includes several programs that support the testing/tutorial process. It is not necessary that the instructor knows how to use these programs, but the laboratory technician will need to spend some time learning the procedures. A file management program (FMS.EXE) helps in the management of the question banks, by indexing the questions, checking technical errors, and creating various subsets and summaries of the test-banks. A test generator (MENUGEN.EXE) generates the tests with randomization on two levels and creates a menu from which students can select appropriate quizzes and practices. The instructor can begin tests for selected periods of time and an electronic class roll prevents unauthorized students from taking the test.

As indicated above, tests may be prepared for students on two levels: review questions with no score and quizzes for which the score is saved. For the review questions (called practice tests), students may practice any number of times and each time different questions will be provided, depending on the number of similar versions in the test-bank. The time spent on the test is recorded but the score is not. So the students may work on questions and study the hints and solutions without worrying about the stigma of getting a low grade.

An 8-digit coding system is used and this allows the instructor to select the types of questions selected at random by the computer. Usually the coding system has the form:

<Course Chapter Section Concept Question No (2 digits) Version Number (2 digits).>

Hence a question with code 21323003 represents the second course (Elementary Algebra), chapter 1, section 3, topic 2, question 30, and version 03. A practice test consists of a collection of four digit codes, so that the instructor can select questions within a particular topic, but the questions and versions are selected at random for presentation to the student. When the student takes the review test (tutorial), hints and solutions are provided, and the student gets immediate feedback. An actual quiz consists of a collection of six digit codes, so that the instructor can select specific types of questions; the only difference between the tests for one student and another is the version of the question. The degree of difficulty of the same quiz given to different students will be the same. Moreover, the amount of time allowed to complete the test is specified in setting up the quiz. When a student takes an actual test, answers can be changed as on a paper test, but the student will not be able to review missed questions and look over the solutions until he or she finishes the test. The students can be directed to show work on paper while taking a test on the computer.

A schematic of the on-line review and practice testing procedures is given at the end of this paper. This test-generating software also allows setting up make-up quizzes. This process uses item-analysis (see below) so that the make-up quizzes are harder than the original tests.

The instructor can prepare printed tests in a similar manner. Several versions can be constructed. The test banks contain some open-ended questions, so that some questions on the printed test can be short-answer rather than multiple choice.

Course Management System, Record Management System, and Item Analysis

The Course Management System (CMS.EXE) produces an electronic grade book, so that scores can be entered into the grade book quickly and easily directly from the file server. This is a

powerful feature for large classes. Besides electronic transfer of scores on tests to the class roll, the course management system allows for manual entering of grades, a wide variety of methods to determine grades, and periodic progress reports to students. These periodic progress reports have proved popular among the students, since the reports indicate to the students exactly where they stand in the class and allow the students to make corrections if some scores are inaccurate. Another program provides an item analysis of the test results for each type of question.

Electronic Lecture Notes

Electronic Lecture Notes have been installed for Basic Mathematics, Beginning Algebra, and Pre-calculus (including College algebra and Trigonometry). Chemistry and Biology Notes are also available for first-year college courses. The electronic lecture notes, (also known as EDUCO Electronic Tutors) are based on Asymmetric's Toolbook. They provide extensive use of dynamic graphs, animation, attractive screen designs, and colorful display of concepts and strategies for solving problems. (See examples of typical screens at the end of these notes).

Text and diagrams are presented a little bit at a time, and the student can "click" on various links or proceed in a step-by-step manner. Examples are worked out in detail with explanations, again one step at a time. The electronic lecture notes can be used by the instructor for display to the entire class as a substitute for the chalk and talk approach. They are particularly effective when animation or visualization is required, such as the secant line approaching the tangent line, the Riemman sum, volumes of revolution, and three-dimensional graphs. Use of the electronic lecture notes allows teachers to stay well organized and informed and to reduce time spent in writing on the board. Since the electronic lecture notes are available to students after the class is over, the students can concentrate on the discussion and do not need to take notes. Electronic Lecture Notes allow the instructor to present a variety of kinds of activities in class. I use them in place of lecture for twenty or twenty-five minutes once or twice a week.

The electronic lecture notes can also be used by students in the computer lab as tutorials complementing class lectures. If a student misses a class, she or he can easily make up the work by using the software. The material corresponds to text book materials. They can also be used as enrichment for material not covered in class for the advanced student. I have prepared guided instructions for students to use the electronic lecture notes, setting out in detail what the students should cover on the computer, asking them to write down the basic results and examples shown, and directing them to work problems similar to those displayed. This approach is particularly useful when I am away from campus or after a quiz. In the latter situation, these guided instructions are used when students finish at various times and can begin studying for the next topic while others finish the quiz.

Textbooks

The textbooks used in Elementary Algebra and Calculus at Bennett are also published by EDUCO International Inc. The organization and scope of the topics in the textbooks are compatible with the test-banks and the electronic lecture notes. These textbooks emphasize a practical approach and are to be used as a supplement to the electronic lecture notes. This allows flexibility to the instructor to provide investigative activities and proofs as is warranted by the nature of the class and

the abilities of the students. Since we can only offer one section of calculus at Bennett, this one class must accommodate the needs of not only mathematics majors, but also students from the sciences, psychology, and business. The use of the tutorial question-banks and the electronic lecture notes for individualized learning allows for teaching students in these diverse disciplines.

MATHCAD

In calculus we use an additional methodology, namely MathCAD, a mathematical software that allows students to pursue the graphical and numerical aspects of the subject material. While many students are familiar with graphing calculators, some are not. With the software students can investigate problems, mathematical concepts, and results numerically and graphically either during a lecture or discussion of homework in class or on their own as a lab exercise. The use of computer software allows for investigations in depth of a problem as well as the opportunity to write explanations and to print out the graph, table, and written material. The technology can be used as an integral part of the process of formulation, solution, and communication.

Student Attitudes

Students have responded to the use of the ICISS materials and the electronic lecture notes in class and in the computer lab in a favorable way. A summary of the results of recent questionnaires follows.

STUDENT QUESTIONNAIRE CALCULUS

Use of Electronic Lecture Notes

SA Strongly agree; A Agree; N No opinion; D Disagree; SD Strongly Disagree

1. Electronic Lecture Notes have been used some days as a partial substitute for the class lecture. This has been helpful in general.

SA	16%	A	84%	N		D		SD
----	-----	---	-----	---	--	---	--	----

2. Electronic Lecture Notes have been helpful in demonstrating limits.

SA	11%	A	63%	N	16%	D		SD
----	-----	---	-----	---	-----	---	--	----

3. Electronic Lecture Notes have been helpful in demonstrating the concept of derivative as a slope of tangent line.

SA	11%	A	42%	N	31%	D	16%	SD
----	-----	---	-----	---	-----	---	-----	----

4. Electronic Lecture Notes have been helpful in demonstrating the concept of derivatives as instantaneous velocity.

SA	11%	A	47%	N	21%	D	16%	SD	5%
----	-----	---	-----	---	-----	---	-----	----	----

5. Electronic Lecture Notes have been helpful in demonstrating the concept of related rates (sliding ladders, rising balloons, etc.).

SA	30%	A	30%	N	25%	D	5%	SD	10%
----	-----	---	-----	---	-----	---	----	----	-----

6. There was one exercise in which you were asked to go through a topic on electronic lecture notes on your own--the rules for derivatives. This was a good way to work through the ideas and learn the rules on my own.

SA 63% A 26% N 11% D SD

7. Guided assignments for individual use of Electronic Lecture Notes should be given more often.

SA 37% A 32% N 16% D 11% SD 4%

8. The instructor should lecture and go over homework problems and not use Electronic Notes during class.

SA 16% A N 21% D 39% SD 24%

9. I have voluntarily used Electronic Lecture Notes on my own:

Never Once or Twice A few times Frequently
32% 32% 36%

BASIC ALGEBRA MA 99

Use of the Electronic Lecture Notes and ICISS

SA Strongly agree; A Agree; N No opinion; D Disagree; SD Strongly Disagree

1. Electronic Lecture Notes have been used some days as a partial substitute for the class lecture. This has been helpful in general.

SA 25% A 55% N 5% D 10% SD

2. Electronic Lecture Notes have been helpful in demonstrating solving equations.

SA 35% A 60% N 5% D SD

3. Electronic Lecture Notes have been helpful in demonstrating how to solve word problems.

SA 10% A 60% N 10% D 15% SD 5%

4. Electronic Lecture Notes have been helpful in demonstrating graphing a line.

SA 25% A 55% N 20% D SD 5%

5. There was one exercise in which you were asked to go through a topic on electronic lecture notes on your own--the rules for derivatives. This was a good way to work through the ideas and learn the rules on my own.

SA 35% A 45% N 15% D SD

6. Guided assignments for individual use of Electronic Lecture Notes should be given more frequently.

SD 25% A 45% N 30% D SD

7. The instructor should lecture and go over homework problems and not use Electronic Notes during class.

SA 15% A N 15% D 45% SD 20%

1997 ASCUE Proceedings

8 The test-bank reviews for each of the topics helped me to prepare for quizzes and tests.

SA 45% A 45% N 20% D SD

9. Frequent quizzes and makeup quizzes helped me to learn the concepts on a regular basis.

SA 35% A 55% N 5% D 5% SD

10. Periodic progress reports from the computer were helpful and should be continued.

SA 55% A 35% N 5% D SD

References

Algebra Part I, by Man Sharma and Ravinder Kumar, (McDonough GA: EDUCO International Inc., 1996).

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Calculus Part I (Third Edition) by Jagmohan Kapoor and Man Sharma, (McDonough GA: EDUCO International Inc., 1996).

Calculus Part II (Third Edition) by Jagmohan Kapoor and Man Sharma, (McDonough GA: EDUCO International Inc., 1996).

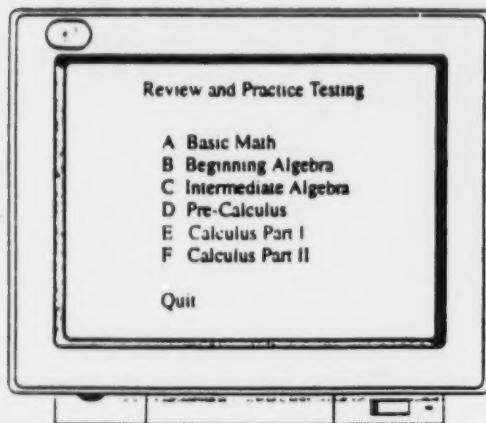
Calculus Part III by Jagmohan Kapoor and Man Sharma, (McDonough GA: EDUCO International Inc., 1996).

ICISS Software and the Electronic Tutor Version 2.0 (which includes courses in Basic Mathematics, Algebra Part I (Elementary Algebra), Pre-calculus, Calculus I, Calculus II, Calculus III, General Chemistry, and General Biology) are available from EDUCO International Inc., 1948 Chambers Rd., McDonough GA 30352. Phone 1-800-963-3826, FAX 1-770-954-9060.

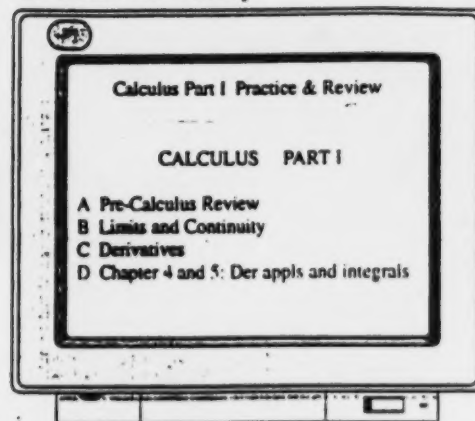
On line Review and Practice Testing

◆ Sample Screens

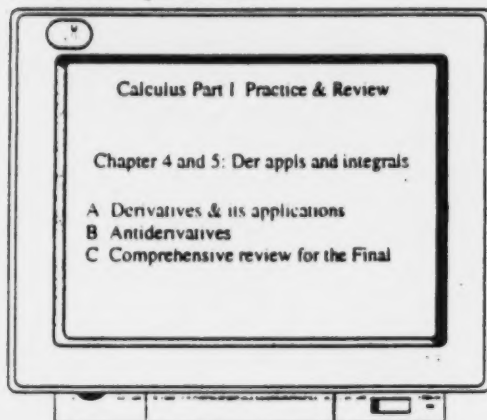
1. Select a course



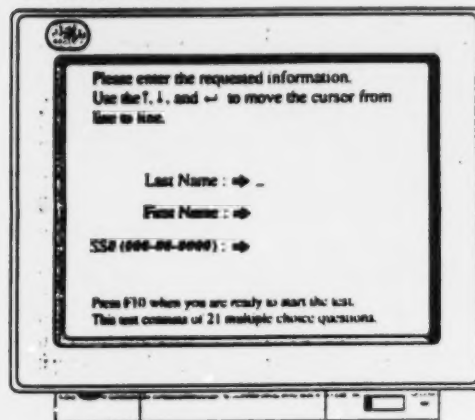
2. Select the concept



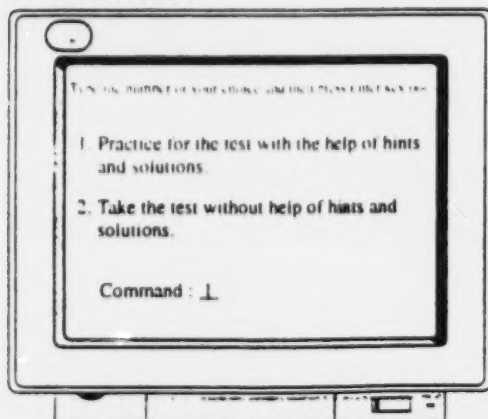
3. Select QUIZ/TEST



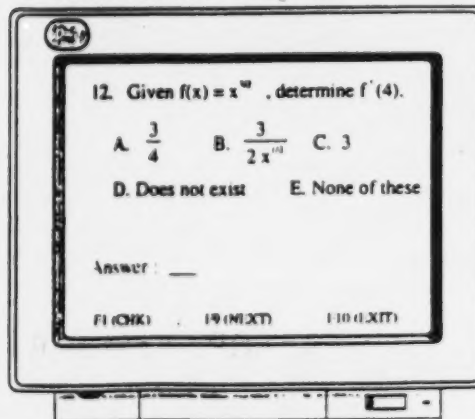
4. Identification



5. Select mode

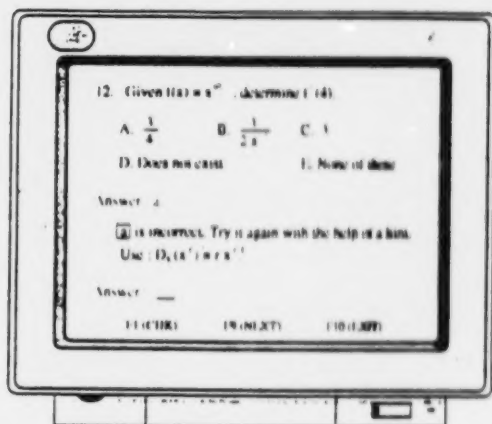
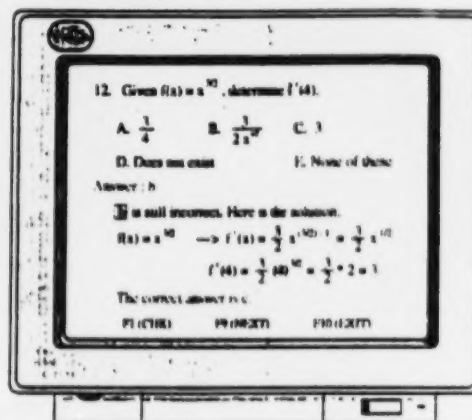
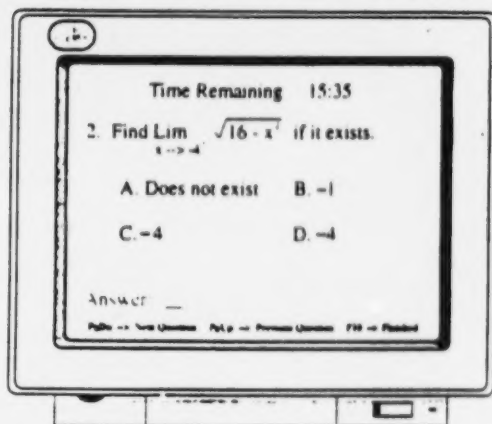
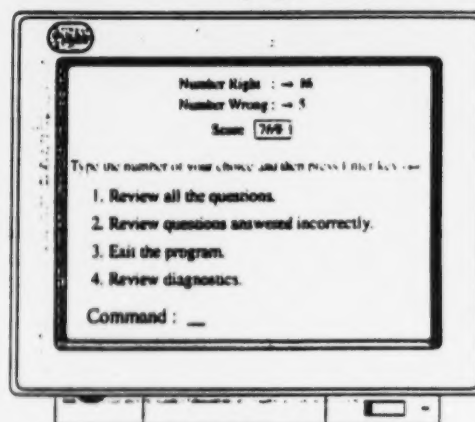


6. Practice Mode: Response



On line Review and Practice Testing

7. Response incorrect: Hint provided

8. Response incorrect again:
Solution provided9. Test Mode Option:
Option 2 from select mode screen (#5)10. Test Completed with F10 or
Time is over and program stops the test

◆ On entering 2 provides solution to the missed items.

◆ On entering 3 we exit from testing with scores saved in the result file that can be directly transferred to the grade book.

BEST COPY AVAILABLE

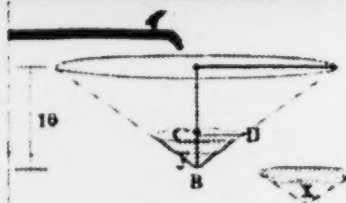
Ex 3) A conical tank (with vertex down) is 40ft. across the top and 10ft. deep. If water is flowing into the tank at the rate of 10cu. ft/m., find the rate of change of the depth of the water when it is 6ft. deep.

Step 1: After time t , BC = depth of water and CD = radius of water cone.

Step 2: The rate of volume of water cone BCD is given, so label it as x .

Step 3: We want the rate of change of the depth of water, so we label it as y .

Step 4: Volume of water cone:



$$x = \frac{1}{3} \pi (CD)^2 y$$

Volume of a circular cone of radius r and height h is:

$$V = \frac{1}{3} \pi r^2 h$$

Ex 3) A conical tank (with vertex down) is 40ft. across the top and 10ft. deep. If water is flowing into the tank at the rate of 10cu. ft/n., find the rate of change of the depth of the water when it is 6ft. deep.

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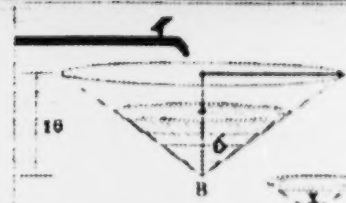
Step 3: We want the rate of change of the depth of water, so we label it as y .

Step 4: Volume of water cone: $x = \frac{4}{3} \pi y^3$

Step 5: $\frac{dx}{dt} = 4\pi y^2 \frac{dy}{dt}$

Step 6: In the final situation, $BC = y = 6$ and $dx/dt = 10$.

Step 7: Substitute in Step 5 and solve.



$$10 = 4\pi (6)^2 \frac{dy}{dt}$$

$$\frac{dy}{dt} = \frac{10}{144\pi}$$

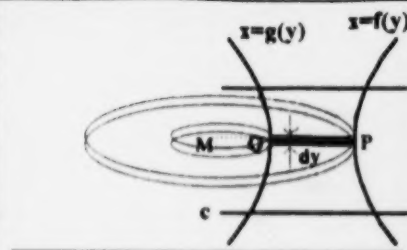
$$= \frac{5}{72\pi} \text{ ft/m}$$

Washer Method/Shell Method

Observation:

When the typical rectangle is ~~perpendicular~~ parallel to the axis of rotation, it generates a 'Washer'.

Let the HS region be bounded by $x = f(y)$, $x = g(y)$, $y = c$, and $y = d$.



Washer Method/Shell Method

Observation:

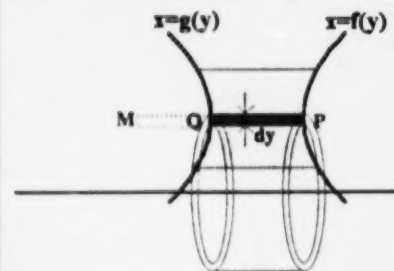
When the typical rectangle is ~~perpendicular~~ parallel to the axis of rotation, it generates a 'Washer'.

When it is ~~parallel~~ perpendicular to the axis of rotation, it generates a cylindrical 'Shell'.

Notice that the position (either parallel or perpendicular to the axis of rotation) of the typical rectangle will determine the choice of the method — either Washer Method or Shell Method.

Shell Method

Let the HS region be bounded by $x = f(y)$, $x = g(y)$, $y = c$, and $y = d$.



Distance Education VIA the Internet (Methodology and Results)

William Verbrugge, Ph.D.

Assistant Vice Chancellor for Instruction and Information Technology

Purdue University Calumet

2200 169th Street

Hammond, IN 46323

phone: (219) 989-2516

fax: (219) 989-2755

verbrugg@calument.purdue.edu

Abstract:

Purdue Calumet now offers 8 courses over the internet. This session will present the planning and development of establishing these courses; Present Pros and Cons from both the faculty and student view point; Present some of the policies (and lack of) developed; List what we found that works and what does not work; and Discuss what is needed to be successful. Interaction and ideas from the audience will be solicited.

Distance learning via the internet provide the student with the "any time , any where" advantage, but does not add the "independent learning" disadvantage that usually came with the advantage.

A. Planning: or why did we jump?

A1. About Purdue Calumet...

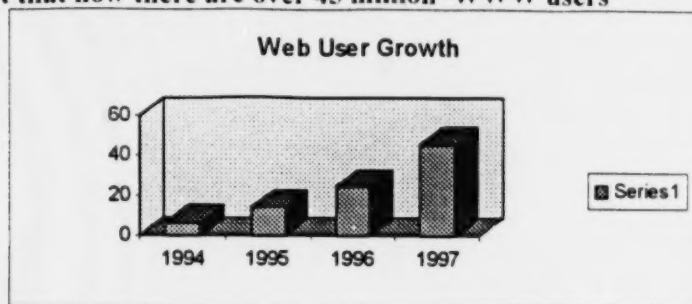
Purdue University Calumet is a convenient, Hammond, Indiana campus location in the Purdue University system. It is a spacious 180-acre, 12-building regional commuter campus...just 25 miles southeast of downtown Chicago, less than three miles east of the Indiana/Illinois border. It is a comprehensive, full service university. Our 9,200+ students range in age from 16 to 60. Minority students comprise 24% of our enrollment. 55%+ of our students attend on a part-time basis.

A2. Data indicates that distance education via the internet is a needed learning option...

- Today, there are more than- 14 million college students.
- Only about 3 million students attend full-time in residency and are less than 22 years of age.
- 42 % of all undergraduates in the U.S. are 25 years of age and older
- College enrollment will only increase 5 % among students under 25, but a 16 % increase is projected among students over 25.
- 80 % of the workforce of the year 2000 is already in the workplace today.
- 75 % of the current workforce will need significant retraining in the next decade.
- 46% of households with computers are now on-line

Data from PBS Adult satellite service " Higher Education Trends"- The National center for Educational Statistics

And the fact that now there are over 45 million WWW users



Market opportunities: According to the College Board, 46 million adults are being educated outside of academe, compared to the 7 million enrolled in colleges and universities in credit programs and about 10 million participating in noncredit offerings.

A3. Distance Education Committee created...

State wide activity and beginning development of courses on campus prompted the chancellor to form a committee to recommend a plan for distance education. Purdue University Calumet (PUC) has been a receiver of distance education for a number of years. The committee found that there were a number of faculty interested in developing courseware that would allow PUC to be a provider. The establishment of the Faculty Instructional Technical Services(FITS) lab several years ago provides a means for our faculty to become proficient in using technology in the classroom and has thus become a springboard for getting faculty ready for delivering distance education. The committee concluded that the University should take an active role in keeping on top of the various trends in distance education and encourage and support our faculty in creating multimedia presentations that will increase learning and position the University to be a provider of distance education.

Through the efforts of the committee PUC then had a distance education mission and goals which provided some direction for departments that wanted to explore distance education.

Committee's Distance Education Mission Statement:

Purdue Calumet will be knowledgeable of Distance Education activities in the State and nationally. We will run pilot projects on those methodologies that seem to have potential to help meet the University mission and expand on those projects that benefit the University, our students, and the community.

Committee's established Goals:

- a) Increase student access to course content without regard to time or place
- b) Establish facilities and services to support course development by faculty
- c) Develop and test integrated distributed learning and multimedia technologies
- d) Strengthen links between PUC faculty expertise and K-12 educational needs
- e) Strengthen links between PUC faculty expertise and corporate educational needs
- f) Encourage and support the development of "learner-centered" courseware
- g) Establish a variety of technology-rich master classrooms and laboratories
- h) Provide support for research on the effects of technology-based teaching strategies

- i) Establish a comprehensive academic technologies software library
- j) Provide teleconferencing facilities
- k) Position PUC to provide training and other related support for K-12 teachers and students

A4. A pilot course was established...

**Sue Conners from Purdue's ISCP department provided the following results from her project:
(this is an excerpt from her report)**

Pilot Overview

The CIS 286 distance education pilot consisted of a twelve week course during the 1996 summer session. Fourteen students were enrolled in the course with one student on the roster never participating in the class and one withdrawing due to equipment failure. The remaining students completed the course by communicating via Email with the instructor and using Telnet sessions to complete their lab assignments on university systems.

Class Composition

The students enrolled in the course represented both genders, various ages and ethnic backgrounds. There were eight women and four men completing the class. The eight women included two African-Americans and one Indian students. The other nine were Caucasian. Three students were post-baccalaureate certificate majors in ISCP, three were part of other SPS programs and six students were ISCP majors.

Course Content

The CIS 286 Operating Systems I class is a required class to complete an associate degree in the ISCP program. The course includes basic operating system concepts and terminology as well as an experiential lab component. Supplemental information to the text was supplied in PowerPoint presentations. Topics included: memory management, process management, I/O systems, and file handling. Laboratory assignments were required on the university AS400, AXP, and Sun UNIX systems.

Course Preparation

The course was taught entirely via the Internet and email. The instructor used personal equipment and Internet access from an independent provider. The home page created for the course was placed on the university web server and the university AS400, Alpha, and UNIX systems were used for the lab component of the course.

All supplemental materials used for the course were created as PowerPoint presentations. Corresponding reading and homework assignments were assigned in the text book and all information regarding those assignments placed on the home page.

The CTIS staff assisted in identifying what systems could be accessed through Telnet for the distance

1997 ASCUE Proceedings

education course and helped test electronic mail capabilities. CTIS also supported the web page development and implementation. Accounts for the students were created on the AS400, AXP, and UNIX systems.

New labs that could be completed through Telnet access were developed for the course. Students were asked to save their lab work on the respective systems rather than submit copies of printouts.

The tests were given on campus and were not modified from the traditional class form. The traditional midterm and final exam were required and the same tests used for the Spring on campus class were used for the summer distance education section.

A teaching assistant was hired to assist in answering phone questions, maintaining the home page, and posting grades on a spreadsheet. The original home page was modified and expanded several times through out the semester to accommodate student needs and problems.

Results of Student Course Evaluation

A course evaluation was administered twice in the semester when midterm and final tests were taken. There were nine questions, six required a rating and three allowed the students to express their own thoughts. A rating of 1 indicated strong disagreement. A rating of 5 indicated strong agreement. The results of the evaluations are displayed in the following tables. The number of students indicating that rating are indicated.

Course Evaluation done after the final exam:

<u>QUESTION</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
1. I understand what is expected of me in this course	0	1	1	2	7
2. My instructor is readily available for consultation	0	1	0	3	7
3. My background is sufficient to enable me to use course material	0	1	2	4	4
4. Lab Assignments are reasonable in length and complexity	0	0	4	4	3
5. One real strength of this course is the virtual study groups	1	0	4	2	4
6. Directions for course assignments are clear and specific	0	1	2	3	5
7. What do you like best about this course? <i>Staying at home. Not dealing with campus. Working on my own. Not coming here 4 nights a week. Lots of support. Flexibility. Convenience.</i>					
8. What do you like least about this course? <i>Phone. Email. Lack of hearing lecture. Lack of interaction with students and professor. Labs. Material emphasis.</i>					

9. Recommendations for future students taking this course.

Form study groups. Study for tests.

The student ratings were slightly lower on the final course evaluation due to technical problems with the laboratory assignments in the second half of the course. These evaluations and comments may aid other distance education instructors in preparing their courses. Overall there was a positive response to the class.

Comparison of Student Outcomes to Traditional Class

The distance education students were required to come to campus to take the same written midterm and final that the traditional class completed in the Spring semester. The homework assignments were identical to the traditional class. The lab assignments were modified to accommodate the Telnet sessions but did not differ significantly in number or complexity from the traditional class. The comparison of final grades in the distance education course and the Spring traditional course indicate that the distance education course is a viable method of instruction.

GRADE	Spring 1996	Distance Education Pilot
A	4	4
B	9	4
C	4	3
D	0	1
F	1	1
Total Students	18	13

B. My experience in distance learning with a Management Information Systems (systems analysis) course...**Course Description:**

An integrated approach to Management Information Systems with emphasis on business systems analysis, design, development, and implementation. Students will use the relational database management system Access on a microcomputer. Groups of three (3) students each will be assigned into "project teams". Each team will be assigned a case study problem which allows for the practical application of the concepts discussed during class.

This course was taught in the traditional classroom method and at the same time via internet distance education with four volunteers. The only requirement of the volunteers was they were not

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to ever see me in person. It was interesting to note that I had half the class volunteer.

Team project required:

This class operated much like the pilot class, but did have the uniqueness of having a team project / case study where the team would then present their results. This was handled by the team Emailing their powerpoint presentation and presenting it via a telephone conference call. It was like we were all sitting in the same room with a video projector.

Results:

The Distance Ed people performed higher marks than the regular students. I did, however, pick the older students to do the distance ed.

Since the internet course was available to all the students, by the end of the course only 50% were attending my lectures (not sure what that means!!).

I discovered a lot needs to be developed to reduce the instructors time in class monitoring. This probably will come with better presentations.

C. The success of the pilot course encouraged the faculty to do more development.

The copy of the ISCP Distance Education home page illustrated on the next page indicates positive development and a commitment from the department to improve and move forward despite all the technical and policy needs. Some of these needs have been resolved. I am sure that there will always be new challenges as we continue to enhance our instructional delivery.

C1. Things I found worked well..

Two procedures that worked very well were FTP and TELNET.

FTP allowed students to see and transfer/download files (e.g. under the button " Get Lab 1 Data" was -- (ftp://verbruwg@axp.calumet.purdue.edu/lab1.c))

TELNET allowed students to remotely login and do assignments, send and receive files (telnet://verbruwg@axp.calumet.purdue.edu).

Methods of creating the class on the WEB

I have also discovered many good development tools that make putting courses on the WEB easier. I have no idea which are better or best, but a few I have used in part are:

ShowBase	www.showbase.com	-- update the WEB by updating a database
Asymetrix Web Publisher	www.asymetrix.com	-- a template (fill in the blank approach)
HotMetal Pro	www.softquad.com	-- good converter of text files to html with lots of design goodies



Purdue University Calumet

Information Systems & Computer Programming Department

ISCP Distance Learning



"Go the Distance with Distance Learning"

Distance Learning

Distance Learning study allows students to take classes at a distance say from the campus in Hammond, Indiana. Courses are delivered through a variety of media including printed media, internet, internship, videotape, audio tape, computer mediated instruction, interactive computer media, bulletin boards, data bases, facsimiles, telephone and various forms of directed study.

Table of Contents (hot links to courses)

CIS 204- Introduction to Computer Based Systems
CIS 205- Information Systems for Management
CIS 215- Structured Program Development
CIS 216- Object-Oriented Program Development
CIS 262 - Introduction to C Programming
CIS 286 - Computer Operating Systems
CIS 340 - Data Communications
CIS 351 - Decision Support and Expert Systems
CIS 490A - Advanced Computer Utilization

Return to:
ISCP Home Page
Purdue University Calumet Home Page

C2. Issues...

The assignment of faculty workload and faculty/departmental credit for teaching students in both on-site and "virtual" classrooms (how will distance learning courses be counted?).

The organization and support of student support services in a distributed teaching environment. Distance education programs hold definite implications for student advising and tutoring; for the training and assignment of graduate student instructors at the sending and receiving sites; for library public services, such as bibliographic instruction.

Copyright laws affect what the Web developer can include on a site. How have you coped with including material in your on-line lessons that under classroom conditions could be photocopied?

What is your policy on access to your on-line teaching resources?

The issue of faculty incentives for developing new modes of teaching

C3. Needs...

- Security for grade posting

- Security for testing

- You are alive probe - continuous contact and tracking of student progress

- Methods to do automatic grading and recording of assignments

- List serves, news groups, and chat training and enhancements of their capabilities

- Need for consistency in developed courses -- presentations of information - how assignments are sent -- how grades are viewed -- head page format - overall structure

D. Summary...

The experience I gained in my trial course and what I have learned from the other faculty and students at PUC has convinced me that the methods of learning and delivery of education will change, and those that don't respond to these changes will be replaced by those that do. I feel that technology is mature and affordable enough that new methods of learning will become a part of our delivery of knowledge to our students and the community. In this past year PUC was experiencing more activity in distance education than it has in the last ten years. Questions about Who, When, Where with respect to distance education were coming from both faculty and staff as the current influx of distance education activity was invading our campus.

How do faculty get involved?; What is the procedure for offering a distance education course?; Where does one go to get information on policy?; Who is responsible for setting up the infrastructure and deciding what the infrastructure is? ; How is the faculty member compensated ?; Who owns the course - is this like a text book?; etc.? These questions and many more imply that Universities needs to have a place where the answer to these questions may be obtained. It is imperative that institutions establish an office (new or new duties in an existing office) where all related agenda of distance education may be found and coordinated.

Distance Education via the internet will not only change when and where people will learn , but will enhance the delivery of instruction in the traditional classroom.

Delivering Library Information Across the Network One Model for Successful Implementations

William P. Wilson
Selection Team, Information Resources
Gettysburg College
Gettysburg, PA
wilson@gettysburg.edu

Brian Hawkins, Vice President of Information Resources at Brown University, and others have correctly warned libraries of the economic realities of the day: individual academic libraries will not be able to keep pace with the double reality of prices increasing above budgetary increases and the explosion of information sources needed by their faculty and staff. We need to provide our patrons of the future with ubiquitous access to an ever wider range of information from their desktops with easy to use interfaces in a cost effective manner. Many of our campus networks provides the infrastructure required to make this work. We can call on our network to simplify the process that faculty and students go through now to access information. Enhanced access to this information can make the research enterprise less frustrating and result in more and better sources being available for member of our academic community.

The components of such a system could include (a) electronic awareness products which would allow our faculty to stay abreast on new work in their areas of interest; (b) access to electronic full text and abstracts for all users; as well as (c) document delivery for those articles which can not be accessed in a direct manner, either through local subscriptions or full text. There may also be areas of a collection where electronic access to full text books and other materials would prove beneficial. Of course any major change to access like this raises a myriad of additional issues. These include:

- I. Costs
- II. Local vs. remote access
- III. User acceptance of the changes
- IV. Shifting of personnel that may be required
- V. Shifting of costs that may be required
- VI. Integration of services and user interface issues

This paper will first provide an overview of the services that are available that provide one of the three types of services listed above. Following that, issues that we will confront while implementing this service will be discussed, with examples of how different products would solve these issues differently. Finally, I will look at a number of issues related to implementing this type of change on our campuses.

Product Categories

Awareness Products

This segment of the market is mainly geared for our faculty and other professionals on our campuses. In one form or other this service aims to make users aware of new journal material as it is published. In the past this service was epitomized by a weekly paper copy of Current Contents being distributed around a department. These products cover a large number of journal titles (exceeding 10,000).

Exemplars of this Product Class

CARL

Product name: Uncover

Cost: Varies

Description: This service provides table of contents that are e-mailed for each faculty member who has a profile.

Institute for Scientific Information

Product Name: Journal Tracker

Cost: \$99/year per person

Description: A profile is built for each person, with up to 25 journals allowed per person. Table of contents and abstract for each journal is e-mailed to the individual as they become available. It allows for the ordering of any of these titles through ISI document delivery.

Publisher Full-Text Electronic Access

Several publishers have begun on their own to provide electronic versions of selected titles or all of their journals over the Internet. Typically these require that the library already own a paper subscription of the title, although there are exceptions. Several publishers are dealing with consortial groups to help lower prices to individual libraries. Most of these publishers have not yet made their electronic text available to any of the larger full text vendors.

Exemplars of this Product Class

Academic Press

Product Name: IDEAL

Cost: Complex formula

Description: Academic Press works with consortia to provide electronic access for all of its 175 titles. No backfiles are available. Each consortia can provide access to as many titles as members of the Consortia subscribes to.

American Institute of Physics

Product Name: AIP Journals Online

Cost: Price of paper subscriptions

Description: Starting with 1997 all their titles will have electronic versions as well. Get access

to the titles you have paper subscriptions for. In this case, subscribers also gain access to a service called PINET Plus which allows users access to wider searching of table of contents and abstracts of a broader physics print database. An awareness service for their journals is included.

Chadwyck-Healey

Product Name: Literature Online (Lion)

Cost: Varies with database.

Description: Different because it does not deal with journal information. A dynamic collection of full text sources available on their web site and links to those available at other sites. Arranged in databases that cover areas such as African-American Poetry 1760-1900, American Poetry, Eighteenth Century fiction, Editions and Adaptations of Shakespeare, English drama. Priced based on number concurrent users we wish to allow access at any one time.

General Vendor Electronic Text Providers

This category of product is a third-party vendor who negotiates electronic subscriptions from multiple publishers, packages them, and sells them to libraries.

Exemplars of this Product Class

IAC

Product Name: SearchBank

Cost: varies

Description: We currently have access to this web-based service. It provides access to 900 general academic and 500 business journal titles online, as well as abstracting for up to 3000 titles. People can search within this product, and, if full text is available, print it out. Can select coverage from various databases. They will work with consortia.

JSTOR

Product Name:

Cost: \$15,000 one time, \$2,250 a year

Description: A not for profit that will concentrate on obtaining full runs of a more limited number of journal titles. Initial offering include 40+ titles, of which we have 33.

UMI

Product Name: Proquest Direct

Cost: Varies

Description: Another full text database with search capabilities. Returns a table of hits with indicators of level of information is available for any given hit; (a) bibliographic, (b) abstract, (c) full text, (d) image, or (e) text plus graphics. Document delivery is also integrated. Two pricing schemes; per use or site license.

Indexing Products

Some products on the market simply provide bibliographic information which then the patron takes and either moves to another product to determine its availability

Exemplars of this Product Class

Silverplatter

Various databases (PsycLit, MLA, Sociofile, Medline)

Cost: Varies with database; based on database and number of simultaneous users

Description: Silverplatter products currently are index only, but with the addition of SilverLinker (just announced) they will leapfrog the market since this will allow dynamic linking right to the electronic full text, where available. A number of vendors have negotiated and are apparently ready to make their databases ERL compliant so this can happen across databases as well. Reports make it look like they will allow linking to a remote site or to data stored locally on platters or hard disk. Plans are in the works for integrating this into document delivery as well.

H.W. Wilson

Product Name: Wilsontapes

Cost: Varies with database

Description: The product we currently have integrated into the opac provides searches of bibliographic entries. It can be tagged to provide information about whether the title is held locally.

University Presses

There are a number of university presses that are providing access to table of contents, abstracts, and some full text free over the Internet.

Exemplars of this Product Class

Cambridge University Press

This is a large press, with about 180 titles. They provide access to most of their titles table of contents and abstracts, some for several years. There is little coverage in the major databases, so it would be good to work what we can into our information service.

MIT Press

They provide abstract-level access to nearly all their journals. Very little overlap with commercial access databases. Date from 1994 or so. Looks like they will be making their full text available to the OCLC product.

Document Delivery Service

There will always, in the foreseeable future, be documents that are not available from the library in paper or full text form. Document Delivery, along with ILL, fill this void.

Exemplars of this Product Class

ISI

Product Name: The Genuine Article

Standard service provides five-year, full-text article coverage from the 7000+ titles covered by ISI's multidisciplinary database offering users access to a comprehensive collection of the world's scholarly science, social sciences, and arts and humanities journals. Articles can be ordered from ISI via OCLC ILL, OCLC FirstSearch, Knight-Ridder Information Services, internet, fax, telephone, and mail. Articles are copyright cleared and royalties are surcharged. Articles are delivered via fax, mail, or courier.

UMI

Product Name: UMI Info Store

Cost: Varies

Description: Available integrated into Proquest Direct; you can also order via the Web. Cost varies at this point.

Implementation Issues

Overview. At least on our campus there is pressure to add journals at a time when Book and Related Materials budgets are not keeping pace with price increases. Many campuses are cutting titles in response to these pressures. We want to see if, in looking over all expenses that make up access to periodic scholarly information (e.g., binding, filming, space, reshelving, repairing, replacement, checkin) whether we can make a case that electronic access provides for increased access to information for the same or reduced costs. There is also an implied assumption that increasing our electronic information resources will allow more distributed access to this information.

Costs

The answer to this question seems to be a resounding "It depends". Site license general products may pay for themselves if the journals covered are satisfactory to your patrons and if there is heavy use of these materials. Another option is to go to simultaneous user pricing which will reduce your costs. Some publishers charge less for an electronic version of their journals, some charge more. There are some value added services that are offered by some publishers (e.g., American Institute of Physics) that will allow for searching across titles and browsing of table of contents and abstracts of all titles in their collection, not just those to which we subscribe. As will be mentioned later, any final analysis of cost savings will have to be made on a more global level. A higher level of electronic access may have an impact on staff levels and certain services such as Interlibrary loan.

Local vs. Remote Access of Information

Search and access to local information works well currently. A search is made, people record the LC access number and go to the shelf to find what they want. This is where sometimes things go wrong that can result in frustration. Particular volumes may not be on the shelf, either as the result of being in use by someone else, misplaced in the library, or lost; a particular article may be ripped out of a journal; or the journal may not have arrived at the library at all or not returned from a department. The equivalent to this in electronic access is slow access time; when retrieval of a document is across the Internet, response times can be slow and frustrating. One question to consider is whether electronic full text should be mounted locally to reduce this possible source of frustration. This would be possible with some of the products mentioned (e.g., SilverPlatter SilverLinker, Wilson, Elsevier), and not possible for other sources (e.g., Academic Press, IAC, UMI). Another consideration is whether journal titles could be divided into core and peripheral titles and maximize access for the core titles. There are also implications for expenditures for servers and disk space if we should elect to mount data locally.

User Acceptance Issues

With any change of operations, especially when it comes to the library, much thought needs to be given to what the patron will be satisfied and comfortable with. Even though from our perspectives we will be providing access to more information more conveniently, not every patron will be ready to willingly accept these changes. These changes will probably have an impact on local departmental printing; costs will increase due to increased printing from the desktop. All information will probably not be available from a single user interface. Some new training may be necessary to use what we offer most efficiently. This issue should be addressed from the outset by including faculty and students in testing of the various main products and soliciting comments, alternative methods of searching for information, and so on. Having some faculty on our side speaking positively of the process and the services will be very helpful as we move ahead.

Possible Shifting of Personnel

As alluded to before, any analysis of cost for electronic access must include other shifting of costs which may result in areas other than journal subscription prices and the institutions' willingness to take this into account. A shift to more electronic information would have an impact on how some personnel would be used within the library, allowing them to be freed up for other services. Of course, this would be a rather gradual shift that may take time to implement within our service groups. Electronic access would impact (a) journal receiving, (b) amount of database holdings updates, (c) initial physical preparation, (d) reshelving of titles, (e) hunting for lost volumes, (f) shelf reading, (g) shelf shifting as the collection grows in certain areas, (h) repair to damaged volumes, (i) volume of claims work, and (j) time processing titles for binding. Relative amounts of savings would of course be dependent on how many paper subscriptions were converted into electronic subscriptions. In addition, there is some "cost" to providing a more reliable service as well. As alluded to earlier, electronic texts do not get lost or damaged, and one subscription can be shared by many people at the same time. Another coincidental benefit would be that we would have more information about what journals people are really using, a good collection development step.

Growth of electronic access could also have an impact on the Interlibrary Loan unit. If we did significantly increase the number of titles people had full text access to, there would be less need to search elsewhere for articles. We could take advantage of features in some products (e.g., EBSCO) to limit hits for students to titles we had available, either in full text or in paper versions, limiting the pressure for ILL. Also, if we were to subscribe to a service like UMI, patrons could do their own document delivery requests, further reducing the work load in ILL.

Possible Shifting of Costs

A move to additional electronic access would have the further impact of cost reductions in ILL and other contracted services. Costs the institution bears for ILL documents would be reduced since faculty would have more access to documents locally. Students would no longer be charged for these types of documents since they could be acquired directly online. The extent of savings would be proportional to how successful we are in getting access to titles that are actually being used by our patrons. This would be offset to a certain extent by increased local printing and some document delivery.

An additional point for savings would center around the binding process. We currently bind a fair amount of our collection. If a certain number of years of collection could be anticipated with online full text (e.g., Wilson is currently quoting 4 years) the library could skip the binding step completely and begin to collect microfilm for archival purposes. If a service like OCLC was selected, even the purchase of microfilm could be eliminated, offering a further savings. Titles available from JSTOR would also reduce the need to buy additional versions of the material, and would serve the further benefit of filling in complete runs of certain titles.

Physical shelf space also is a cost item. A more fully electronic collection would postpone the time when a capital campaign would have to be undertaken for building additional library space.

Finally, it is fairly clear that the distribution of funds would also have to change with any serious electronic text initiative. Expenditures for "central" purchases would go up (for things like Academic Press license, IAC or other full text product), etc. This in turn would leave less funds for the departments, but with a higher proportion of their needs covered with our centrally purchased material, there may still be a perception that their purchasing power has been reduced. This psychological issue needs to be kept in mind and addressed, at least on our campus.

Integration of Services and User Interface Issues

The reality of this electronic access world is that to maximize return for any campus a major effort will be needed to make the service appear friendly. No one service can currently access all sources we would want to make available. Certain vendors (e.g., Academic Press, Elsevier) would not provide their full text via a more general service (e.g., OCLC, EBSCO, IAC, UMI). Not all services provide access to document delivery, nor do we necessarily want all users to have access to document delivery services. As a result, we will have to spend some time designing a user interface to make these various services seem as integrated as possible, and train our users to make best use of what is available. Some services provide multiple looks for their data universe, others do not. SilverPlatter's SilverLinker may provide a unifying technology in the long run, but we'll have

to wait and see if all the major players adopt ERL compliant data forms.

Developing Consortial Arrangements vs. Going Alone

Several vendors (Academic Press and American Institute of Physics) will provide additional value by providing special negotiated arrangements that will increase the purchasing power of individual libraries through consortial arrangements. Academic Press will only deal with consortia. Going it alone would allow us to provide perhaps unique services, but at what cost?

Initiative Implementation

How are we to implement this initiative? First, our model assumes we will not spend more on scholarly journals than we are in this budget year (costs to be included are the IAC contract, Muse license, and paper journal subscriptions, SilverPlatter databases, and any paper indexes primarily used to locate journal material). Any savings that can be directly attributable to this initiative from other areas of operation may be used to support the goals of this project (e.g., reduced binding costs, reduced ILL fees). Second, implementation of the project will begin only after our review of journals has been concluded and we have a better idea of what mix of journals our faculty currently see as of primary interest to our programs and students. Third, there is no concrete way we can compare coverage targets for any of these products until our actual journal needs are better understood.

Review of Current Systems

We have several systems filling the electronic access niche at the moment. We have an agreement with Carl Uncover to provide a stand alone Document Awareness service, which is available to a limited number of faculty at the present time. We have three Wilson databases loaded and tagged with holdings available through the OPAC. This provides searching for journal content within the titles covered in this database and alerts patrons to which titles may be held in our library. We also have SilverPlatter CDs (Medline, Sociofile, PsycLit, MLA) which provide pretty much the same service within specific discipline areas without tagging of which titles we hold. These are now available via the web via ERL technology across campus. We have Project Muse, available via the Web, that allows access to the journals published by Johns Hopkins University Press. We have IAC Searchbank, which allows for searching across a wide number of journals and access to full text for over 900 titles. This is available via the web as well. Finally, we have recently entered into agreements for full text subscriptions to the two journals we subscribe to from the American Mathematics Society, and two more from the American Institute of Physics, both accessible via the web. Add to this collection of electronic sources a number of paper resources that cover the same territory. The equivalent of Document Delivery is being handled by the ILL service at the present time.

This group of services, as is readily apparent, is not a one stop operation. Some information is available only from certain workstations. In addition, some of the resources overlap (Wilson databases and IAC is one example, but much of the SilverPlatter information is probably also duplicated in one or both of those services). We should be able to do better than this with the variety

of products that are on the market today. While we may not truly get a one stop shopping model immediately with any solution, we should be able to cut down on the number of products, reduce duplication and provide more services to our patrons. Our goals for this implementation should include:

1. Increase the accessibility of our library's information
2. Increase the number of titles we are able to access
3. Increase the variety of services provided
4. Simplify access procedures
5. Reduce amount of information overlap in the services we pay for
6. Increase user satisfaction with our electronic access tools
7. Introduce unmediated document delivery services for at least some patrons (faculty)
8. Increase the number of "looks" the data have (e.g., browsing titles, browsing by department or class)

The first agenda item is to work with departments to understand their current needs with respect to journal coverage. We need to perhaps look at this in terms of what each department would label as a core collection title, and then a list of titles which may be more peripheral, yet still useful to support their programs. While this is going on, we would like to bring in a number of products for trial periods so we can get student and faculty comment on their ease of use, search capabilities, and level of integration. While open to all, focus groups of faculty and students should be convened for comprehensive and systematic feedback regarding the services. Once our journal review is complete, we can evaluate the strengths of collection overlap amongst the various services. Finally, we can select our products taking both the collection issues and customer comments and support issues into account.

The Model

Awareness. One service that is being poorly carried out at the moment is current awareness. This service allows researchers to become aware of new articles germane to their areas of expertise to keep abreast of current trends in their field. Not many people have access to this or are aware we provide the service. Several are available. It seems like a good place to start the electronic trail. Improvements to this service would increase user satisfaction with our service and would broaden the type of electronic service we provide. It would be easy to imagine faculty accessing new articles from their desktop, where available, or initiating document delivery for an article they knew we did not have access to. Several services provide integrated document delivery in their awareness services. Such a mechanism would reduce the service demand for ILL.

Journal content. Selecting a product that would provide access to a database or databases that would include bibliographic, abstract, and full text access a range of journals linked to our holdings and directly linkable to the full text product is what we are looking for. As envisioned, people would access a single interface, perform a search, browse the results of the search, perhaps calling up a few abstracts to further explore the value of the article. Any given item would have an indication as to whether it is available in paper within the library, available via full-text, or accessible only through document delivery. Available options would also allow us to display hits only for those items which are available in full text or paper within the library; this would address concerns over excessive ILL use as a result of the electronic indexes currently in use. How the collections archive their data will have an impact on savings in other areas. For example, if we can be sure a vendor will have a four year rolling archive, we would recover binding costs as well and move directly to microfilm after four years.

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